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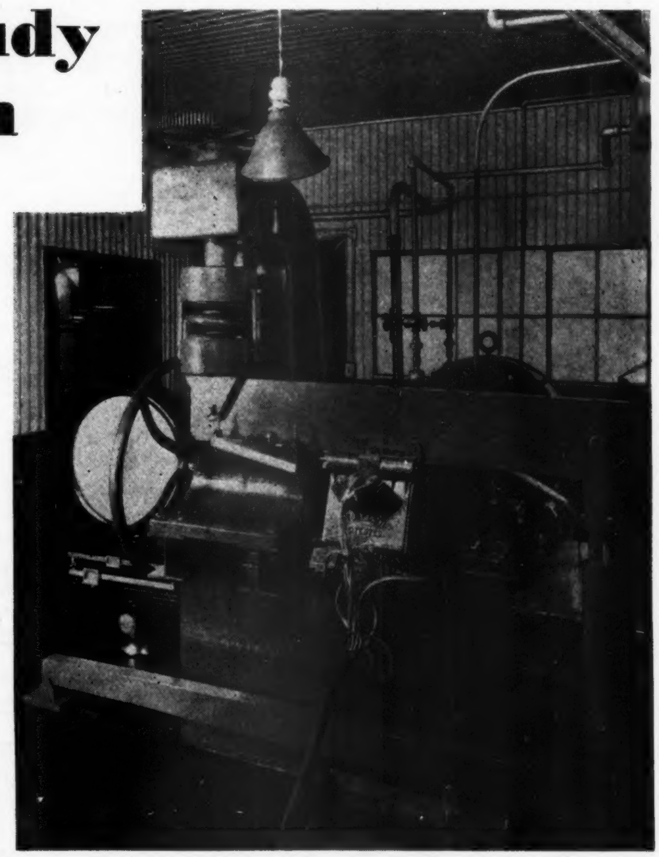
A Test Plant To Study Journal Operation



Front of the machine from the right, showing speed-indicating generator, journal box and pyrometer leads, and the end-leakage measuring device

Description and potentialities of equipment designed to analyze and indicate improvements in journal bearings

THE railroad car journal bearing and its correlated parts exist in greater duplication of units than any other part of rolling stock construction. There are at least 16,000,000 on the railroads in the United States. This number of units is standardized to as great a degree as any other part of the equipment under which they operate. That the present journal bearing and its correlated parts has given an apparent great measure of service in the past is evidenced by the fact that it has remained practically unchanged in the steady advances in mechanical development that have been in process at an accelerated rate in the past decade.

The present day demand for higher speeds under heavier loads over ever increasing operating periods of time has intensified the demand that journal performance must improve or become an ever-increasing factor in retarding economic operation and nullifying the money and effort already invested in improvements in equipment, materials, and facilities.

The railroad car journal assembly is a very simple mechanical construction. To date little is known of the fundamentals upon which its positive successful operation depends.

The first fact evident in a constructive analysis, for the purpose of finding a starting point for improvement, is that there is no base line from which to measure the performance so far obtained or to measure the degree to which performance can be improved; nor the economics of such improvements as are developed. It is further evident that guess work has been all too prevalent in the past and is too expensive for the future.

There being available little or no data of a technical nature, it is evident that the first step in any advancement of the art is to provide adequate means of observing and collecting data representative of operating conditions. It is also necessary to have means of measuring the nature and the degree to which various conditions of bearing construction, lubrication, and operation affect the performance as a whole and the degree to which they augment or detract from the performance of each other.

In order to collect this basic data and to provide means whereby the way to improvement can be charted, and the economic value of the improvement after it is accomplished be measured, the journal testing plant described in this article was put in operation some six months ago by the Railway Service & Supply Company, Indianapolis, Ind., after a long period of research and design.

Description of the Friction Machine

Briefly, the plant consists of a machine using a standard A.R.A. 5½-in. by 10-in. journal, brass, wedge, and box, or in other words the standard construction in general use on one end of a standard A.R.A. axle. This

axle is supported in two large roller bearings, flood lubricated, with the oil stream passing through a cooling system by forced circulation. At the end of the axle opposite the test journal is connected a specially built calibrated motor of ample size to start under any conditions of load up to 30,000 lb. per journal, operate at any rate of speed and at any rate of acceleration. The load is applied to the top of the journal box in the same manner as applied in actual service; that is through an equalizer coil spring and suitable lever arms balancing the load to the platform of an indicating scale. In this manner the load can be varied to any degree at any time and is accurately measured. By virtue of the calibrated motor driving the axle, there is recorded directly the reading of frictional horsepower, which is the measure of all lubricating effect. Speed in miles per hour is recorded in such a manner that the chart of speed in miles per hour and horsepower are directly comparable. Instruments for this purpose are shown in one of the illustrations. Temperatures in three locations in the journal bearing and three or more locations in the journal-box packing under the bearing are indicated by suitable pyrometer equipment. Oil end leakage from the journal and back of the box is measured by suitable connections to the journal box. The effect of windage upon the operation is produced by suitable blast fans directing currents of air against the box at proper velocities. The entire journal testing machine is in a separate room from the operating and recording equipment, permitting the operation of the machine at varying temperatures. The mechanism for the operation and control of the equipment is shown in another of the illustrations.

One great criticism of all efforts in the past in determining the mechanical effect of friction has been that the equipment so used gave the results in comparative figures only and not in their direct economic significance. The effort here has been to spell friction directly in terms of horsepower and not in terms of a coefficient. That this equipment has accomplished this purpose and is able to reproduce results or run check tests is evidenced by the following tabulation of two separate runs under identical conditions, the comparison being in the readings of horsepower-hours per mile per journal.

With this test equipment can also be established the reliability of any specific element of the journal oper-

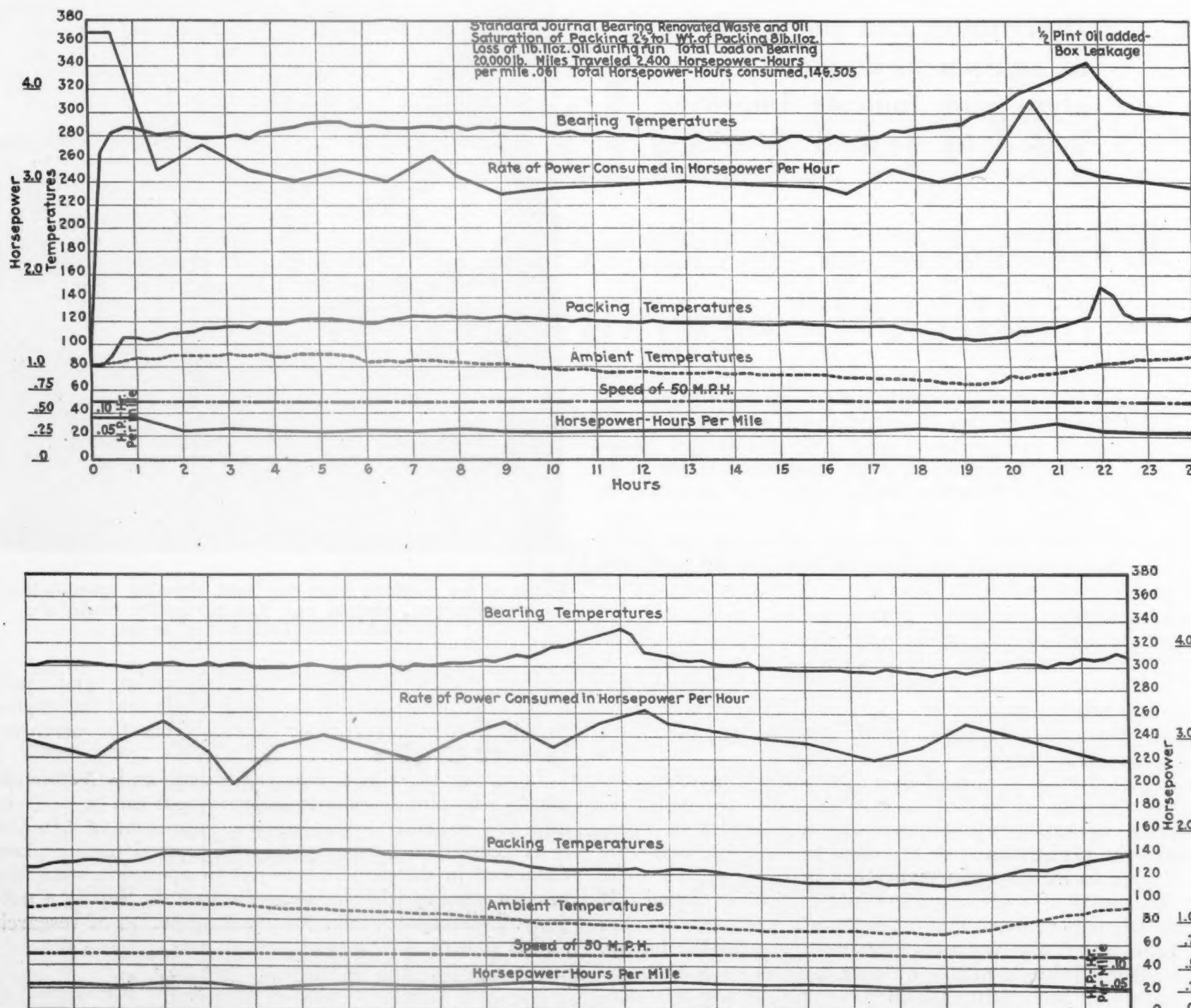
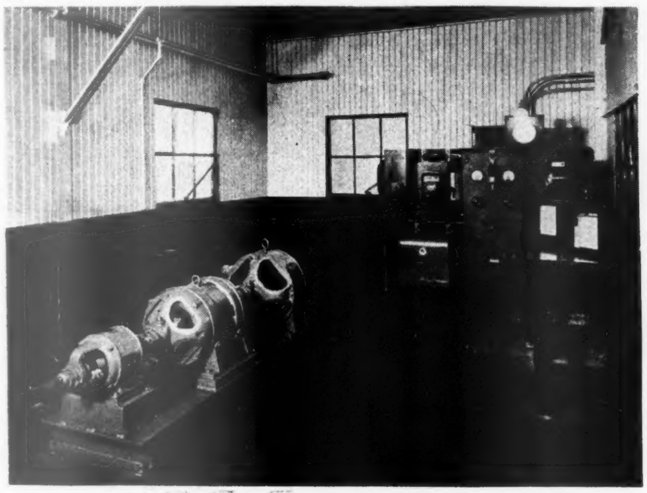


Chart record of a 48-hr. full-load test run

M.P.H.	Miles traveled	Total hp.-hr.	Hp.-hr. per mile	Brass temp.	Amp. temp.
TEST A—RUN NO. 1					
15	3.75	.2237	.059	168	71
20	5.00	.2800	.056	164	72
30	7.50	.4452	.059	168	73
40	10.00	.6078	.061	183	74
50	12.50	.7309	.058	200	76
60	15.00	.8675	.058	220	77
70	17.50	.8791	.050	240	78
TEST A—RUN NO. 2					
15	3.75	.2104	.056	178	71
20	5.00	.2401	.048	178	72
30	7.50	.4452	.059	182	74
40	10.00	.5280	.053	200	73
50	12.50	.6112	.049	211	74
60	15.00	.7478	.050	232	74
70	17.50	.8525	.049	250	76

Total load, 20,000 lb.; Effective bearing area, 24.8 sq. in.; Lb. per sq. in. of bearing area, 806.

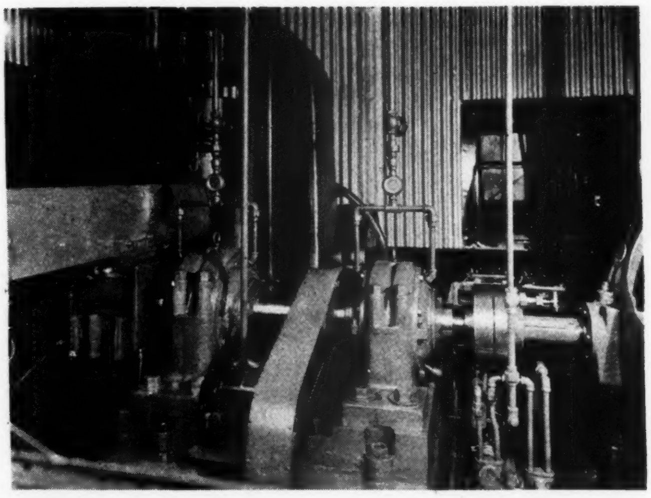
ation as shown by the chart, in which a journal box packed with renovated oil and waste was operated under a load of 20,000 lb. at a speed of 50 m.p.h. for 48 hours without stopping. This is equivalent to the



Control equipment, showing speed-regulating board with recording instruments for horsepower consumption and speed in miles per hour

journal condition under a car of 80 tons spring suspended weight with eight journals operated at 50 m.p.h. for a distance of 2,400 miles. It would be impossible to reproduce this condition in service, the purpose being to indicate the stability of performance that can be expected from a standard A.R.A. journal box assembly and that in the observation of such a run the phenomena of journal lubrication is available for observation and analysis in a manner not possible under any other conditions. It is the purpose in the operation of this test plant first to observe all the operating phenomena of the journal, brass, wedge, waste and oil as they now occur; then by changing one element at a time, improve the performance to the highest degree to which that one element can attain. When all the elements have been so analyzed, the final problem is one of their combination and the establishment of the results to be obtained by their cumulative improvement.

Investigation is to be made as to the degree of saturation of journal-box packing and the effect of this degree of saturation upon the immediate and prolonged service of a journal. The mechanical practices as they pertain to the methods of packing boxes and the degree to which certain practices in packing boxes augment or detract from satisfactory performance are to be investigated. To whatever degree they may contribute to more satisfactory operation, a knowledge of the effect of load, speed, time, and temperature and their relation to each other are to be determined.

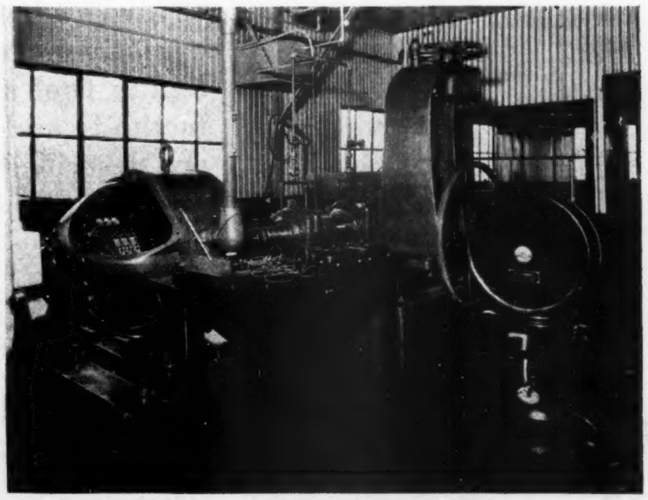


Right side of the machine, showing the axle and supporting roller bearings with oil circulating pump and lines, speed-recorder connection and axle coupled to the motor at the right

From all of the above data, there is constructively the next to the last step; namely, the analyzing of the construction of the journal bearing, both as it involves the materials used and such features as clearance, bearing area, broaching, and prevention of end leakage; investigation of which conditions has already indicated that without affecting the interchangeability of the present journal bearing, certain changes can be made which will prolong the life of the bearing and possibly reduce to a minimum, if not entirely eliminate, the possibility of waste grabs, which are one of the principal results of or causes for hot boxes.

As a final step in the investigation, the construction of journal boxes as they may have a bearing on the economic use or conservation of materials with which the journal box is packed and upon the performance of the journal is to be established.

Pilot tests of the above elements, which have been made during the last six months, have indicated that the cumulative effect of available improvements and the various elements influencing performance as above indicated, would produce a vast improvement in the performance of the present journal and its adjacent parts, and do this for less money than is now being expended.



The machine from the left rear, showing the direct-connected driving motor and calibration instruments for the motor

Stug 2-10-0 type locomotive in freight service on the German State Railways

Stug System of Firing Pulverized Fuel

By R. Roosen

A report of the system being developed for firing pulverized fuel by the "Stug," an association of German locomotive builders which is sponsoring research in the utilization of low-grade fuels for firing locomotives—Test results with lignite fuel are given and the methods and equipment used are described—Part I

FOLLOWING is an abstract of a paper by R. Roosen, chief engineer in charge of the research department, Henschel & Sohn A. G., Kassel, Germany, entitled "The Stug System of Pulverized-Fuel Firing on Locomotives." This paper was contributed by the Railroad Division at the annual meeting of the American Society of Mechanical Engineers, which was held December 1 to 5, 1930, in the Engineering Societies' Building, New York. In addition to his activities as chief engineer for Henschel & Sohn, Mr. Roosen is in charge of the research work for the Studiengesellschaft für Kohlenstaubfeuerung auf Lokomotiven, commonly known as the "Stug," an association of German locomotive builders, and coal and lignite syndicates which was formed to study the utilization of low-grade fuel for firing locomotives. The Stug includes the following firms: A. Borsig, G.m.b.H., Berlin-Tegel; Hanomag, Hannover-Linden; Henschel & Sohn A. G., Kassel; Fried. Krupp A. G., Essen (Ruhr), and Berliner Maschinenbau A. G., vorm. L. Schwartzkopff, Berlin, as well as the German coal and lignite syndicates: Mitteldeutsches Braunkohlensyndikat, Leipzig; Ostelbisches Braunkohlensyndikat, Berlin; Rheinisches Braunkohlensyndikat, Köln am Rhein; Rheinisch-Westfälisches Kohlensyndikat, Essen (Ruhr), and Oberschlesisches Steinkohlen-Syndikat, Gleiwitz.

These are in cooperation with the German State Railways, the offices being at Kassel on the premises of Henschel & Sohn A. G., where the study and research work were carried out.

The abstract of Mr. Roosen's paper follows.

The numerous advantages which pulverized-fuel firing had given in stationary plants strongly suggested its extension to locomotives, considering that a number of advantages in railway operation and economics were to be expected. Among those aimed at, the following are particularly worthy of mention:

1.—Cutting down the fuel bill, which result is achieved by the possibility of using low-grade, cheap fuel, particularly such as would not be suitable for grate firing; reducing the quantity of fuel consumed, as pulverized-fuel firing permits of controlling the fire according to the actual output of the locomotive; reduction of standby losses to a minimum and thus avoiding blowing off of safety valves, and better utilization of fuel, owing to improved boiler efficiency.

2.—Savings in the enginehouse, owing to considerably reduced wage bill for cleaning ashpan, smokebox, and pits.

3.—Quicker readiness for service, as boiler will be steamed in considerably less time.

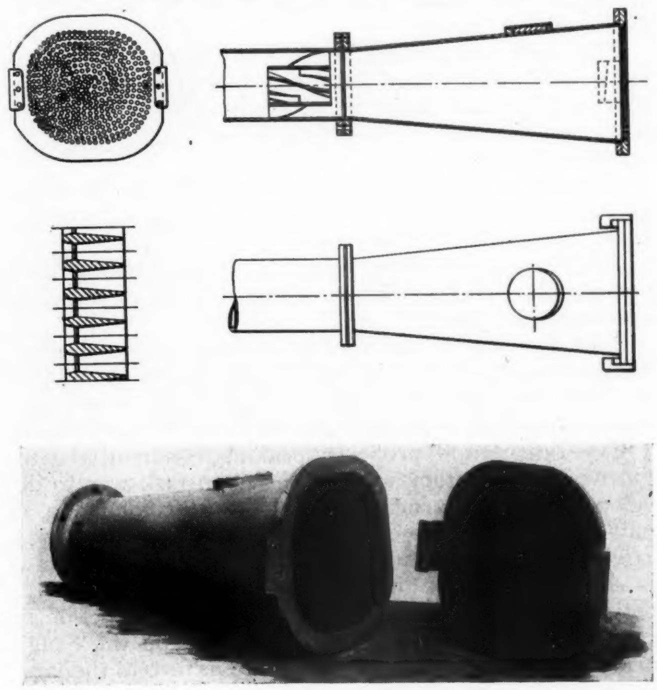
4.—No obstructions to draft by clinker as on the grate of standard engines, and consequently increased locomotive mileage.

5.—Possibility of firing large quantities of fuel in a more economical way than with any other type of mechanical stoking; fireman fatigue completely eliminated.

6.—No sparking at all, avoiding danger of conflagration; no smoke annoyance.'

These advantages have instigated considerable experimenting with a view to applying pulverized-fuel firing to locomotives. The attempts made in the United States and elsewhere, such as in Brazil, Sweden, and England, are too well known to need a résumé. In all these cases, however, difficulties more or less prevented the adoption of pulverized-fuel firing on a large scale. Such difficulties were due to the fact that locomotive boilers with their small furnaces present less favorable conditions than stationary boilers or furnaces. In order to ensure sufficient steaming, the locomotive furnace must be forced to about 10 times the volumetric rate of heat release that is usual in stationary plants. Either the requisite firebox output was not attained or the result was the formation of slag on the tube sheet, which soon caused a decrease in steam generation. This may have been due to the fact that stationary-boiler practice with pulverized-fuel firing was applied to locomotive boilers without due consideration being given to their peculiar conditions of service. Either the types of burners employed or the method of supplying air did not prove suitable for generating in the relatively small firebox the amount of heat necessary to develop the requisite quantity of steam or to ensure combustion under such conditions as would preclude trouble with the slag. Any departure from the normal firebox, however, was not advisable, because it was important, in order to introduce design of the lining also made it apt to crumble and break down under the influence of running shocks. All this entailed continuous and expensive repair work.

Another problem to be faced was the limited space on



New design of Stug pulverized-fuel burner for locomotives

the locomotive and tender available for the pulverized-fuel equipment, which of course must be arranged so as to combine reliability with economy.

The aforementioned difficulties made pulverized-fuel

Table I—Tests Made in the Rothenditmold Testing Plant on Lignite Fuel

Date	6-24-25	6-24-25	6-5-25	6-23-25
Test No.	76	76	72	74
Lower heating value, B.t.u. per lb.	9,360	9,360	9,360	9,360
Fuel consumption, lb. per hour	1,850	2,290	2,625	3,260
Firebox heat output, B.t.u. per cu. ft. per hour	1.2×10^5	1.48×10^8	1.69×10^8	2.1×10^5
Evaporation, lb. per hour	9,060	11,080	12,100	14,350
Temperature of feedwater, deg. F.	51.8	51.8	51.8	51.8
Coefficient of evaporation	4.88	4.83	4.61	4.38
Evaporation of heating surface, lb. per sq. ft. per hour	9.35	11.42	12.50	14.80
Boiler pressure, lb. per sq. in.	85.3	85.3	85.3	85.3
Average temperature of superheated steam, deg. F.	742	726	689	698
Average temperature of flue gas in smokebox, deg. F.	738	706	698	717
Analysis of flue gas — CO_2, per cent	15.6	15.6	14.9	14.2
Analysis of flue gas — O_2, per cent	.....	.....	.....	.....
Analysis of flue gas — CO, per cent	.....	.....	.....	.....
Boiler efficiency, determined from flue-gas losses, per cent	71.7	73.1	72.5	71.3
Free heating surface in firebox (not brick-lined), sq. ft.				100.3
Heating surface in tubes, sq. ft.				867.4
Total heating surface, sq. ft.				967.7
Firebox capacity, cu. ft.				144.7

$$\frac{\text{Free heating surface in firebox (sq. ft.)}}{\text{total heating surface (sq. ft.)}} \ldots\ldots \frac{100.3}{967.7} = \frac{1}{9.65}$$

$$\frac{\text{Firebox capacity (cu. ft.)}}{\text{total heating surface (sq. ft.)}} \ldots\ldots \frac{144.7}{967.7} = \frac{1}{6.68}$$

pulverized-fuel firing without considerable initial cost, to abide by the approved pattern, with a view to the easy conversion of existing locomotives into dust-fired engines.

Moreover, the form of the firebox brick lining, which was deemed necessary in a too close imitation of stationary practice, was a delicate problem. The high temperatures in the firebox resulting from excessive lining, combined with the action of the long, sharp pin flames produced by the types of burners employed, caused a progressive destruction of the brickwork. The complicated firing on locomotives a difficult problem with which to cope. On the other hand, there was sufficient incitement to tackle it anew and bring about definitely satisfactory results. It was with this object in mind that the Stug was formed when after the war economical considerations in Germany urged the use of low-grade fuel for locomotive firing, particularly lignite, which was available in abundance. The experiments were to evolve a system which would combine the following features: A rate of evaporation of 12.3 lb. of steam per square foot of heating surface per hour; variation of burner

output within the wide range between maximum and minimum rates; high boiler efficiency and prevention of honeycombing so as to ensure continuous operation without trouble due to slag deposits; simple and highly resistive brick lining, and utmost working reliability of the whole equipment.

The work was systematically carried out on the largest possible scale, since there was a clear understanding that real success could be attained only by making a sound combination of theoretical investigation and experimental work.

In order to avoid from the inception the shortcomings of earlier experiments, two principal requirements had to be fulfilled in the first place:

1.—Shaping the flame so as to fill the whole firebox and avoiding the pin flames which deteriorate the tube sheet or brick lining.

2.—Obtaining a high specific intensity of combustion for peak loads of about 230,000 B.t.u. per cu. ft. of firebox volume, and even more in particular cases, i.e., about 10 times the amount obtained in stationary plants.

Experimentation, properly speaking, commenced after thorough preparatory work. The main task was to develop a type of burner suitable for the combustion of pulverized fuel in a locomotive firebox. The result was, after some simplifications of the shape, a burner such as is shown in one of the illustrations, which shows the definite form. This burner, on account of its action, is called a "spray burner," and it is based on the Stug's principle of subdividing the injected mixture to the largest possible extent. It consists essentially of a truncated hollow cone, the front end of which is closed by a plate having a large number of nozzle-shaped holes, whereas the small rear end joins a mixing device for the coal dust and air mixture entering at this point. The dust and air mixture is thus spread into a considerable number of individual jets which are ignited almost immediately in front of the burner plate, and this causes the formation of a diffused, ball-shaped flame.

Clogging of the numerous holes by dust was never experienced. The burner or burners, which are thus constructed in a simple manner, are so arranged that the spray plates come nearly flush with the firebox back plate, while the burner bodies are outside. The burner bodies therefore remain cold when in operation; the spray plate, which is exposed to radiating heat, being cooled by the coal dust and air mixture. Special cooling of the burners can thus be dispensed with. If one of the burners is out of operation, it is cooled during that time by a small current of pure air.

In order to achieve correct design of the burner and furnace, a large number of questions had to be studied, such as the process of combustion, the intensity of combustion, influence of the shape and dimensions of the brick lining on combustion, etc. Thus, the intensity of combustion, expressed in thermal units per cubic foot of firebox volume, is inversely proportional to the gas volume developed during the time of combustion of the dust. The latter must not remain in the firebox for less time than it takes for complete combustion, and the gas speed in the firebox, therefore, must not exceed the velocity of combustion of a dust grain. The gas volume developed during the time of combustion must consequently remain in the firebox until combustion of the dust grain is completed. The gas volume, however, increases with increasing temperature, i.e., lowering the temperature would permit of increasing the intensity of combustion, and this can be effected by reducing the brick lining.

Shortening the combustion period of the dust grain has the same effect. It can be obtained, besides, by proper mixture of the dust and air in the burners, as mentioned before, by increasing the fineness of milling of the coal. This process, however, if pushed beyond commercial practice, may become uneconomical, so that the use of this method is curtailed. Thus the Stug uses a degree of fineness of about 15 to 25 per cent residues on a 170-mesh sieve for lignite and about 10 to 20 per cent for coal containing a low percentage of volatiles.

All this investigation work required a large number of tests. Under these conditions the Stug obtained, as early as 1925, in a locomotive boiler of 967.7 sq. ft. heating surface, an evaporation from cold feedwater of 14.3 lb. of steam per square foot of heating surface, combustion being entirely satisfactory (see Table I).

When the German State Railways, on the strength of these results, called upon the Stug to obtain a rate of evaporation of 12.3 lb. of steam per square foot of heating surface per hour in the G-12 class locomotive boiler, the desired result was obtained only after further experimental work. The difficulty was that this boiler has a firebox considerably smaller in relation to the heating surface than the boiler tested in the first place (ratio 1 to 9.65 as against 1 to 14.9). It thus became necessary to raise the intensity of combustion to more than 237,000 B.t.u. per cu. ft. per hour. The brick lining was ac-

Table II—Tests Made in the Mittelfeld Testing Plant on Lignite Fuel

Date	3-22-28	4-24-28	6-26-28	5-18-28	11-11-27	11-11-27
Test No.	343	354	379	362	283	284
Lower heating value, B.t.u. per lb.	10,060	8,950	8,500	9,420	8,725	8,725
Fuel consumption, lb. per hour	4,380	5,390	6,080	6,180	7,680	8,500
Firebox heat output, B.t.u. per cu. ft. per hour	1.98×10^5	2.17×10^5	2.32×10^5	2.61×10^6	3.10×10^5	3.33×10^5
Evaporation, lb. per hour	26,150	29,600	30,620	34,200	36,960	40,500
Temperature of feedwater, deg. F.	212	212	206	210	212	212
Coefficient of evaporation	5.96	5.50	5.03	5.53	4.82	4.77
Evaporation of heating surface, lb. per sq. ft. per hour	12.52	14.18	14.70	16.40	17.70	19.40
Boiler pressure, lb. per sq. in.	170.7	170.7	167.8	170.7	163.6	169.4
Average temperature of superheated steam, deg. F.	770	689	768	711	644	655
Average temperature of flue gas in smokebox, deg. F.	635	646	638	696	882	912
Analysis of flue gas: CO_2, per cent	14.7	15.1	14.85	14.3	13.5	13.1
Analysis of flue gas: O_2, per cent	2.65	3.1	2.0	2.6	5.0	4.8
Analysis of flue gas: CO, per cent	0.25	0.40	0.20	0.33	......	......
Boiler efficiency, determined from flue-gas losses, per cent	73.0	72.9	73,25	70.8	66.2	64.7
Free heating surface in firebox (not brick-lined), sq. ft.						139.9
Heating surface in tubes, sq. ft.						1945.1
Total heating surface, sq. ft.						2085.0
Firebox capacity, cu. ft.						222.5
$\frac{\text{Free heating surface in firebox (sq. ft.)}}{\text{total heating surface (sq. ft.)}}$					$= \frac{139.9}{2085.0}$	$= \frac{1}{14.9}$
$\frac{\text{(Firebox capacity (cu. ft.)}}{\text{total heating surface (sq. ft.)}}$					$= \frac{222.5}{2085.0}$	$= \frac{1}{9.36}$

tually reduced to a minimum, and was just sufficient for the heat from the incandescent lining below the brick arch to be radiated back to the burner, and to protect the casing which has taken the place of the ashpan. Under these conditions the Stug even succeeded in intermittently raising the intensity to about 316,000 B.t.u. per cu. ft. per hour and the steam generation to well above 20.5 lb. per sq. ft. of heating surface per hour, which result, to the author's knowledge, has never been equaled by any other type of stoking on locomotives (see Table II). Indeed, this is more than a locomotive boiler would continuously stand. On analysis the flue gases were found to contain 13.5 per cent carbon dioxide and 5 per cent oxygen. The smoke emitted from the chimney was transparent and showed a grayish hue. The fuel was a commercial quality of lignite dust developing about 9,000 B.t.u. per lb. when ground to about 20 per cent residue on a 170-mesh screen.

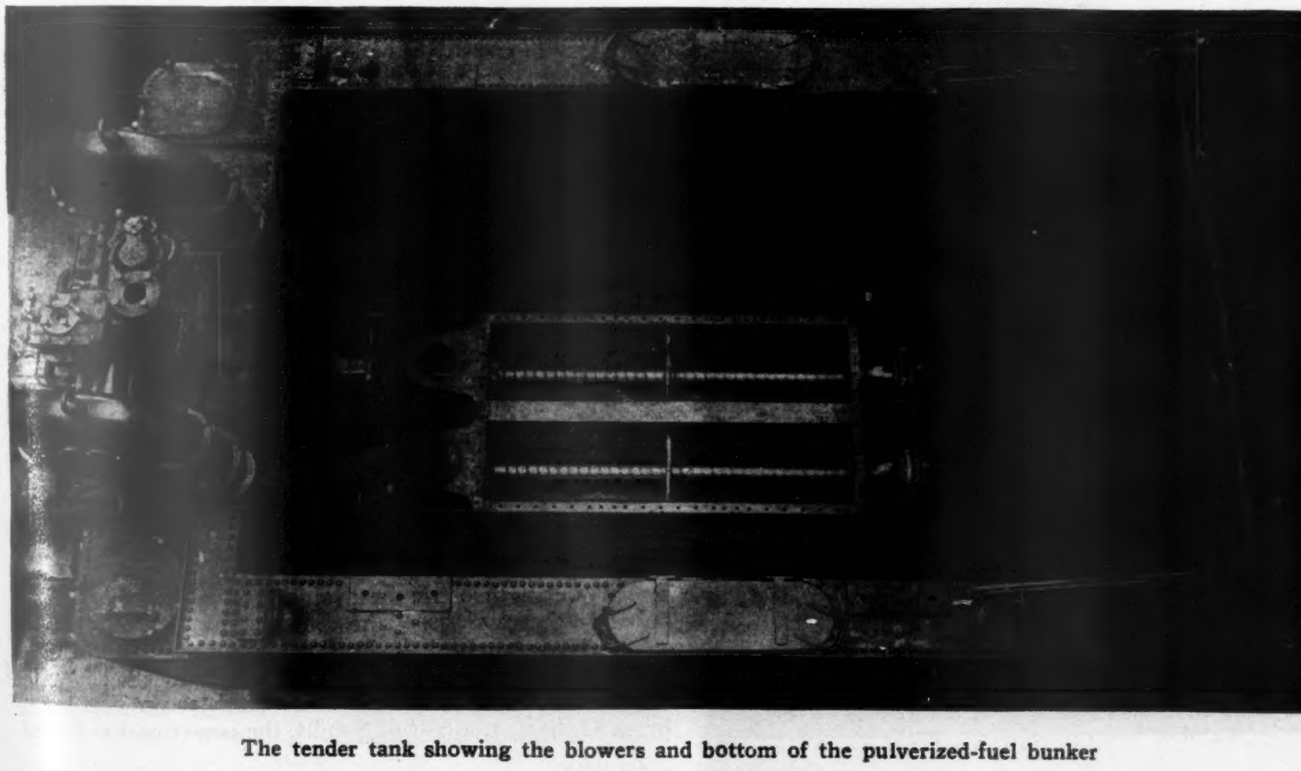
After these excellent results were obtained, the German State Railways placed an order with Henschel & Sohn, one of the members of the Stug, to fit a coal-dust burning apparatus on two heavy 2-10-0 type superheated freight locomotives of the G-12 class. These locomotives are of three-cylinder design with a heating surface of 2,100 sq. ft. and a grate area of 42.0 sq. ft. The tender is of the six wheel type and, when converted, retained the existing frame. Two burners of the type previously described are arranged below the firebox back plate, the spray plate having about 1,900 holes and allowing the passage of about 3,300 lb. per burner per hour. The ashpan is replaced by a casing suspended from the foundation ring. This casing is lined all over with firebrick, which radiate the heat stored in them back to the burners and thus assist in igniting the coal dust and air mixture. The brick lining of the wall opposite to the burners, below the brick arch, serves the same purpose. Apart from this, the firebox walls, nearly down to the foundation ring, are without any lining. This arrangement makes the whole of the surface in contact with the water highly evaporative and further affords easy observation of the staybolts. In the bottom of the casting a small auxiliary burner is provided, the operation of which is independent from the main burners. The front part of the casing is fitted with a bottom slide, operated from the fireman's side of the cab. Apart from this, the locomotives have not undergone any noteworthy modifications.

The tender tank, of 3,740 gal. capacity, is of the water-leg type. The usual coal bunker is replaced by the pulverized-fuel reservoir having a capacity of about 6.4 tons and is constructed as a closed container with sloping sides. This shape is preferable to a cylindrical container, because it makes for a steady flow of the coal dust and does not allow it to rest in the lower portion of the container. For the same reason the container is welded and not riveted, so as to avoid projecting edges. In addition, stirring nozzles are provided in the container sides. The container is supported on the water tank at four points, and can easily be lifted as a unit. It is provided with three filling apertures in the top, which also afford access for occasional inspection. As a rule, one of these openings is sufficient for filling purposes.

At the base of the container are three trough-shaped feedways, those on the outside housing the conveyor worms for the two main burners, while the conveyor screw for the auxiliary burner is lodged in the small central trough. These worms convey the coal dust toward an opening, through which it pours down into the air stream from the blowers. These worms can be clutched and declutched separately.

At the rear end of the water tank is the blower which supplies the air for combustion, and it should be noted that in this first lot of locomotives all of the air necessary for combustion is furnished by the blowers. This method keeps the excess of air in the firebox down to a minimum and ensures maximum boiler efficiency. The blowers are coupled to the turbine shaft, which revolves at a maximum speed of 4,500 r.p.m. and operates on saturated steam taken from the dome of the boiler. From the blower the air flows through two separate

(Concluded on page 134)



The tender tank showing the blowers and bottom of the pulverized-fuel bunker

A 300-hp. stator, impregnated with an insulating varnish, about to be placed in the armature-baking oven

Industrial Electric Heating For Railway Shops*

By Wirt S. Scott†

A study of operating costs of electrical-heating equipment installed in the Norfolk & Western shops at Roanoke, Va., and savings effected by its use

BECAUSE comparatively little was known until recently of the steam-railway industry's attitude towards the use of electricity for heat treating, a study was made to determine the economic value of electrically-heated equipment installed in Norfolk & Western Shops at Roanoke, Va. In the foregoing part of this article, which appeared in the February issue of the *Railway Mechanical Engineer,* a study was made of electrically-heated furnaces for heat-treating tool steel, for carburizing locomotive parts and for annealing steel castings, comparing costs and quality of work produced by heating mediums used prior to the installation of the electrically-heated equipment and the savings effected by the adoption of the latter.

Core Baking Ovens

The use of electricity on a large scale in the Norfolk & Western Shops at Roanoke, Va., for heating core-baking ovens was of unusual interest since this form of heat for core baking has not received general acceptance to the same extent that it has in other applications. There are three large electrically-heated core-baking ovens in operation, each oven being 8½ ft. wide, 17½ ft. deep and 11½ ft. high. The electrical capacity of the ovens is 185 kw., 3 phase, 60 cycle, 220 volts. They are truck operated, each oven holding 2 trucks, 6 ft. wide by 8 ft. long, weighing 9,000 lb.

Cores made at these shops are usually quite large. The loss of such cores or the castings in which they are used represents an appreciable sum of money. Hence, an investigation was made to determine if any evidence was available as to actual savings made since the installation of electrically-heated equipment.

An interview with the foreman and assistant foreman, brought out the facts that with the use of coke-fired core-baking ovens, they had to depend on labor to fire the furnaces and attempt some sort of temperature control. The oven was often either too hot or not hot enough, with the result that most cores were underbaked, while a considerable number were overbaked. Occasionally the entire day's work of a core maker would be lost when burned cores would fall to pieces. Castings were repeatedly lost on account of blow holes caused by green or partly baked cores. In many instances, these small holes, caused by the escape of excess vapor, did not show up until the casting was being machined, and sometimes the major part of the machining had been done before the defect could be discovered.

Since using electric heat an improvement has been noted in the castings. The difficulty of blow holes resulting from underbaked cores has been completely eliminated. An average charge of cores per oven will weigh 9,000 lb., and the power consumption is 800 kw.-hr. per bake. At a cost of 8 mills, the power cost is $6.40

* This article appears in two parts, the first of which was published in the February issue.

† The author is special representative of the Westinghouse Electric & Manufacturing Company.

per oven per bake, or $19.20 for the three ovens. The average value of the cores for the three ovens is $150 including labor and material, and for the steel castings annealed and sand blasted $2,000. The saving in loss of cores is placed at three per cent, or $4.50 per day, and the saving in the loss in steel castings at one and one-half per cent, or $30 a day.

Using fuel-fired ovens, the labor of 75 per cent of one man's time was required for firing and watching the ovens. This amounts to 6 hours at 57 cents per hour, or $3.42 per day.

A summary of the total annual savings for the three electric core-baking ovens show the following:

Savings due to spoiled cores	$1,350
Saving in steel castings	9,000
Labor for attending ovens	1,026
Total gross savings	$11,376
Power cost	5,760
Net savings per year	5,636

A summary of the opinion expressed relative to the electric core-baking ovens indicated that the objections raised in connection with the coke-fired ovens had been minimized and in some cases entirely eliminated.

Armature Baking Oven

In the electrical repair department there is installed an oven for baking varnish on electrical coils, such as armatures, field coils, stators, and locomotive headlight generators. These parts, when brought in for repairs, are given a final treatment of an impregnating varnish and then baked in an electric oven from 24 to 72 hours at a temperature of 250 deg. F.

The oven is a standard product designed and sold for such purposes. The inside dimensions are 4 ft. 2 in. wide, 9 ft. 8 in. long, 6 ft. 2 in. high in the clear, exclusive of the space required by the heaters mounted along the sides. An exhauster set is used for forced ventilation and for recirculating the air. The electrical capacity is 30 kw.

The foreman of the electrical department stated that from his records, the useful lives of the coils impregnated and baked in the electric oven had been extended to double the life prior to the adoption of the method. When baking the coils in a fuel-fired oven, it is practically impossible to maintain sufficiently close temperature regulation to prevent underbaking or overbaking coils, which treatment is not better than no baking at all. This is advanced as the reason why electrically-baked coils have doubled the life of those used before the installation of the electrical equipment. Small coils are dipped in the varnish, allowed to drain, and hung up in the oven for baking. Large coils are sprayed with a spray gun and run into the oven on a truck. All coils are thoroughly baked out before being impregnated. The oven has been in operation, day and night, seven days a week, for five years and not one cent has been spent for repairs.

In the winding department there are four armature winders and four laborers employed at a total labor cost of $1,456 per month. Since the life of coils has been increased 100 per cent since using the baking oven, the amount of labor that would be required in the winding department would have amounted to $2,912 a month, or a direct saving of $1,456 a month or $17,472 per year.

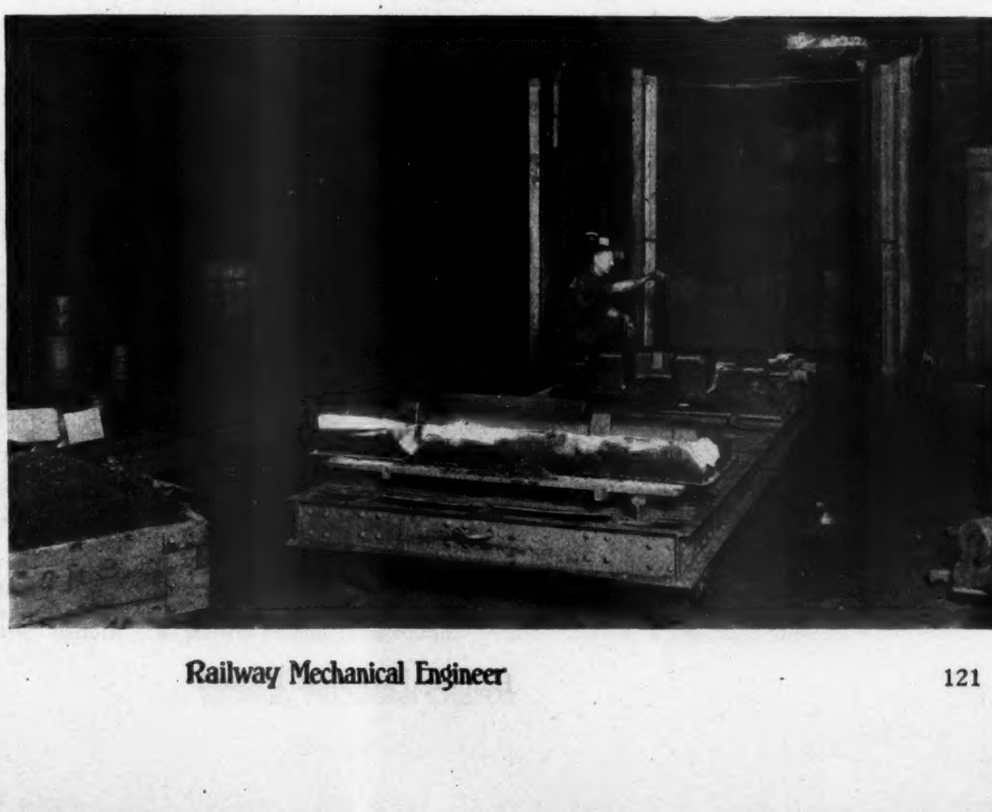
Babbitting Bearings

The babbitting department process consists of melting down the babbitt from the old journal bearings, machining and tinning the brasses, babbitting and milling the bearing. The worn out journal bearings coming into the department are delivered in a truck along side an electrically-heated rectangular melting pot, 20 in. wide, 54 in. long, 18 in. deep, which is heated with five, 10-kw. immersion heaters. The temperature of the bath is regulated automatically at 700 deg. F. The brasses are placed directly in the bath, and when the level of the bath rises near to the top of the vessel, the babbitt is ladled out into molds, producing pigs weighing 80 lb. each.

From 400 to 500 worn out bearings are melted down each 8-hour day. After each brass is removed from the bath, it is thoroughly brushed with an air-driven revolving brush, and then inspected for cracks, flaws, or any defects which would make it unsuited for further use. This results in 50 per cent of the brasses being discarded and scrapped. Those passing inspection are placed in a truck, and conveyed to a double milling machine, operated by two men, who mill out the brasses so as to obtain a bright surface for the tinning of the bearing.

The tin pot is also rectangular, 20 in. wide, 30 in. long, and 18 in. deep, and is heated with four 7½-kw. immersion units, having automatic control. The brasses are swabbed with muriatic acid, placed in the tin bath, and kept there in readiness for receiving the babbitt.

The brasses are removed from the tinning pot in pairs,



Core-baking ovens Nos. 1 and 2, each having an electrical capacity of 185 kw. The installation of electrically heated core-baking ovens has resulted in a reduction in loss of cores and a reduction in loss of steel castings valued at many times the cost of the electric current

Top: Electrically heated melting pot where the babbitt is melted out of the old bearings—The brasses are cleaned with a revolving brush, inspected, and those passing the inspection are sent to the boring machine—Bottom: The double lathe used for boring the brasses after inspection

placed on a mandrel, and held in place by means of push rods operated by compressed air cylinders. The babbitt is then ladled into the brasses. The babbitt pot is of the circular type, 21 in. in diameter and 19 in. deep and has 22-kw. capacity, with automatic temperature control. The babbitt used is a lead base, having an approximate composition of 4 per cent tin, 8 per cent antimony and 88 per cent lead. Approximately 1,200 lb. of old babbitt and 1,200 lb. of new babbitt is used every eight hours. The old babbitt is analyzed and a make-up added to keep up the analysis.

After the bearings are poured, they are smoothed off and placed in a finishing milling machine, where they are bored out to exact size.

An analysis of the advantages of electric heat in this department disclosed that the life of a bearing is affected by the temperature to which the babbitt is heated. A variation in temperature of 200 deg. F. from normal will result in a bearing life of only one-fifth of the life that should be obtained under proper temperature conditions. Overheating the babbitt, followed by pouring at the proper temperature is as injurious as pouring at the overheated temperature.

With the coke fuel previously used, a wide variation in temperature resulted. Since using electric heat, the temperature is automatically maintained at a pre-determined point, and it is conservatively estimated that the bearing life has been more than doubled.

There are nine men, including laborers, in the babbitting department who are engaged in melting down old journal bearings and cleaning brasses, machining brasses, tinning bearings and babbitting, trimming and milling bearings. The total labor cost is $4.75 per hour.

With a production of 5,000 bearings a month, at a labor cost of $988, the average labor cost per bearing is 19.25 cents. An average of 1,200 lb. of new babbitt metal per day is used, or 27,200 lb. a month, at 25 cents per pound, making a metal cost of $6,800, or $1.36 per bearing. The total labor and material cost is therefore approximately $1.55 per bearing.

Using fuel-fired furnaces for melting the babbitt, it is estimated that the percentage of worn out bearings for various causes would be distributed as follows: general wear and tear, 50 per cent; improper lubrication, 25 per cent; poor babbitting, 25 per cent.

An analysis of the above would indicate that 25 per cent of the bearings may be defective on account of not being poured at the proper temperature, and that 75 per cent may fail because of wear and tear or improper lubrication before they have a chance to wear out. The savings that may be said to be effected directly by the babbitting will be 12.5 per cent of the total failures, or 625 bearings on a monthly production basis of 5,000 bearings. With the cost of labor and material set at $1.55 per bearing, the monthly savings would be $968.75.

Each of the 625 bearings worn out prematurely must be replaced in the car, at an average labor cost of 77 cents per bearing, or a total cost of $481.25 per month, for labor of replacing bearings.

No record was available as to the former cost of fuel, or the present power consumption. On the basis of similar installations, a conservative estimate can be made of the electric consumption as follows:

The connected load is 102 kw. The average hourly consumption will be 70 per cent of this, or 71 kw. per hour for 208 hours per month, or 15,000 kw.-hr. During the heating-up period each morning, the power is on continuously for 90 minutes, which will add 4,000 kw.-hr. per month, making a total of 19,000 kw.-hr. consumed. At a rate of 8 mills, the cost will be $152 per month.

From the foregoing, it will be noted that the net monthly saving is $1,450, the total of the babbitting-operation savings of $968.75 and the savings effected by eliminating premature installations of bearings, which is $481.25. Since the monthly cost of electric power is $152 the production of better babbitt and longer life of bearing is therefore worth 9.6 times the cost of the electric power.

Another interesting phase of this situation is that the A.R.A. interchange cost of rebabbitting and replacing 6-in. by 11-in. journal bearings is $2.50, which is the difference between $7.50, the cost of a new brass, and $4.90, the allowance on the old one.

With an extended life of 100 per cent on 25 per cent of the bearings, the possible savings on the basis of a billing of $2.50 per bearing replaced by foreign railroads above will represent a considerable sum each year.

The arc-type steel-melting furnace, used in the foundry at the Roanoke Shops was originally rated at 3½ tons capacity, but is now being operated at a capacity of 4½ tons per heat. It was installed to facilitate the securing of castings for repair parts.

Three heats are secured each night. The molders finish their work at 4 p.m. and by 5 or 5:30 p.m. the first heat is ready for pouring. The first heat requires approximately 3½ hours from the time the current is first turned on until it is ready for pouring. Successive heats require from 2½ to 3 hours.

The current consumption averages approximately 740 ~~kw.-hr. per ton, a commendable performance consider-~~ing that the furnace is in operation only from 12 to 13 hours per day. The furnace is operated entirely on scrap materials, made up largely of couplers, angle bars, borings and turnings.

General Summary

In the analysis given in the foregoing, nothing has been said about the former cost of fuel, or the relative maintenance costs of fuel and electric furnaces. The cost of fuel used at the Roanoke Shops was considerably below the average, since the hauling was done by the Norfolk & Western. Oil was delivered at Norfolk via ships at approximately three cents a gallon. The power consumption has been figured conservatively, so that the actual consumption will be within 10 per cent of the figures shown, plus or minus. However, neither the cost of fuel nor the cost of power are deciding factors, and should not be treated with too much importance. Equal attention should be given to other important items entering into the costs analysis.

The maintenance cost on the electric furnaces and oven since installation has been practically nothing, with the result that further savings may reasonably be expected in addition to those outlined in detail. The cost of electric power, whether it be for motors, electric lights, electric ovens or furnaces, becomes a secondary matter when due consideration is given to the results.

One may well inquire as to the reason why electric heating produces such results in comparison with fuel-fired equipment.

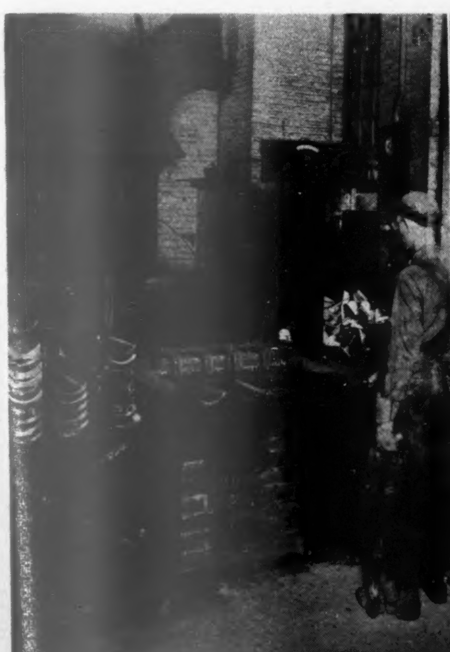
Suppose it is desired to anneal castings at 1,650 deg. F. For best results the temperature of the castings should not vary from normal more than 25 deg. If fuel is used, it is necessary to start with heat generated probably at as many as eight points with a flame temperature of about 3,000 deg. F. A thermocouple is placed within the furnace, care being taken to see that it is not set in the path of the flame. The temperature at that point is called the temperature of the furnace. While this may be the temperature of part of the charge, some parts of ~~the charge will be subjected to the direct radiation of the~~ flame or to an incandescent wall on which the flame is impinging, while other parts will be entirely out of reach of such radiation, and even out of reach of any convection currents. It is not at all difficult to imagine the conditions of heating which will result.

Summary of Power Costs and Savings Effected by the Use of Electric Heat at Roanoke Shops of the N. & W.

Application	Power cost per year	Total savings per year
Babbitting of bearings	$1,824	$17,400
Armature and Coil baking	864	17,472
Tool heat treating	600	6,854
Carburizing	1,413	18,720
Core baking	5,760	11,376
Annealing steel castings	7,344	30,222
Grand Totals	$17,805	$102,044

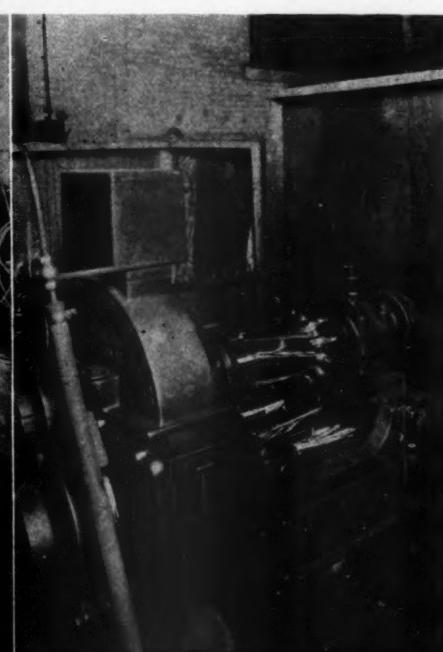
In comparison with this, where a temperature of 1,650 deg. F. is required for the heat-treatment of castings, suppose the heat were generated, not from eight points, but from an infinite number of points, and that the maximum temperature is limited to 1,700 deg. F. instead of 3,000 deg. F. Suppose the heating elements are placed within this furnace chamber in such a manner as to compensate for all door losses and other naturally cold areas within the furnace chamber, and in addition, liberate heat uniformly to the charge. The result is that the furnace atmosphere at every point is at the same temperature, and the entire charge will gradually come up to the temperature of the controlling thermocouple, or 1,650 deg. F., no more, no less.

If time had permitted, many other items of direct saving could have been investigated and brought to light. Deducting the entire cost of electric heating at the Roanoke shops from the savings as recorded, a net minimum saving of $84,139 a year is shown.

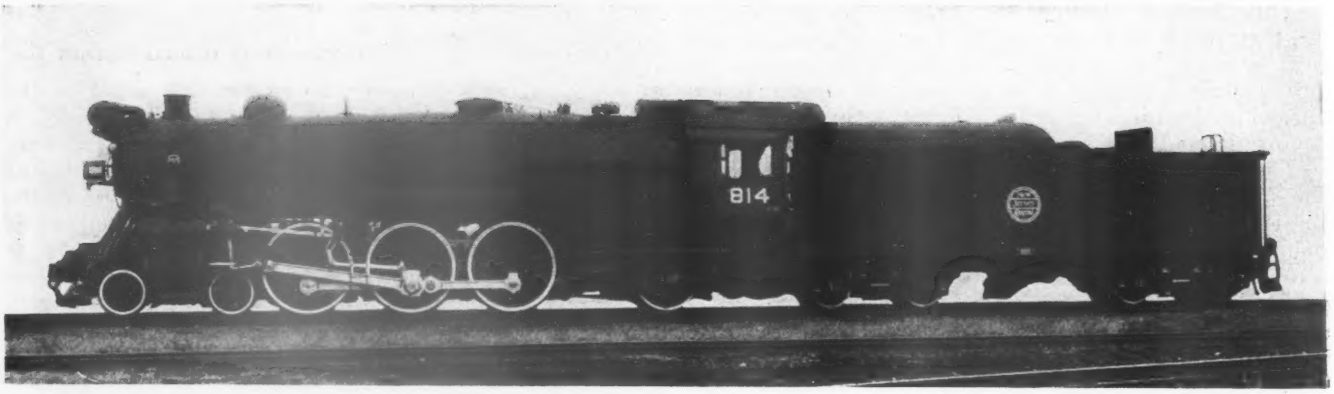


The rectangular tin bath, electrically heated, into which the brasses are placed—The brasses are kept in the bath until ready for receiving the babbitt

Two brasses are placed on a mandrel and held in place by air-operated push rods—The electrically heated babbitt pot is shown in the foreground.



After the bearing has been poured and the edges trimmed, it is placed in a milling machine where it is bored to a specified size.



Central of New Jersey 4-6-2 type locomotive built by the Baldwin Locomotive Works

New Jersey Central 4-6-2 Type Locomotive

Purchased to meet special operating conditions requiring the replacing of locomotives of similar type having a tractive force of 46,841 lb. The new power operates at a boiler pressure of 240 lb. and develops a tractive force of 52,180 lb.

FIVE 4-6-2 type locomotives were delivered in October, 1930, to the Central Railroad of New Jersey by the Baldwin Locomotive Works. These locomotives have considerably greater tractive force than any Pacific type locomotives heretofore used on this road. They bear the road numbers 810 to 814 inclusive and are a modification of previous 4-6-2 designs, developed to meet special operating needs.

With the object of obtaining a locomotive especially suited for handling heavy suburban trains at reasonable speeds and also certain through trains such as the "Williamsporter" and the Philadelphia and Scranton express trains, on the Lehigh and Susquehanna division, where heavy grades are encountered and close clearance restrictions are imposed; a driving wheel 74 in. in diameter was adopted. All previous 4-6-2 type locomotives on this road have had 79-in. drivers. The new locomotives have 26-in. by 28-in. cylinders, the same as their predecessors but the boiler pressure has been increased to 240 lb. per sq. in. instead of 230 lb. which is used on the preceding order of 4-6-2 type locomotives, bearing road numbers 831 to 835, which haul the "Blue Comet" trains between Jersey City, N. J., and Atlantic City and the "Bullet" fast express between Jersey City and Wilkes-Barre, Pa. With these changes, the maximum tractive force has been raised to 52,180 lb. compared with 46,841 lb. for the previous locomotives built in 1927. The weight on the drivers has been increased from 197,660 lb. to 205,900 lb. and the total weight of the engine from 326,470 lb. to 333,830 lb.

In order that these locomotives might be used on the New York and Williamsport express trains operating through the Lansford tunnel on the Nesquehoning branch, between Mauch Chunk, Pa., and Tamaqua, it was necessary to restrict the locomotives to the tunnel clearance limits imposed at this point. The overall height from the top of the rail to the top of the stack was therefore reduced from 15 ft. ⅝ in. on the previous engines to 14 ft. 9-⅞ in., while the center line of the boiler is 2½ in. lower, measuring 9 ft. 10½ in. from the top of the rail.

The capacity of the tenders for the new 4-6-2 type locomotives has also been increased to 13,100 gal. of water, compared with 10,000 gal. for their predecessors but the coal capacity of 15 tons remains the same. This change necessitated increasing the length of the tender-wheel base from 23 ft. 10½ in. to 29 ft. 4½ in. As on the previous order, the water-bottom type of tender

Table Showing the Principal Dimensions, Weights and Proportions of the New Jersey Central 4-6-2 Type Locomotives

Railroad	Central Railroad of New Jersey	
Builder	Baldwin Locomotive Works	
Class	G-4S	G-3S
Road numbers	810 to 814	831 to 835
Type	4-6-2	4-6-2
Service	Passenger	
Cylinders, diameter and stroke	26 in. by 28 in.	26 in. by 28 in.
Valve gear, type	Walschaert	
Valves, piston type, diameter	13 in.	13 in.
Maximum travel	6½ in.	6½ in.
Steam lap	1⅛ in.	1¼ in.
Lead	¼ in.	¼ in.
Exhaust clearance	¼ in.	¼ in.
Weights, in working order:		
On drivers	205,900 lb.	197,660 lb.
On front truck	63,830 lb.	65,850 lb.
On trailing truck	64,100 lb.	62,960 lb.
Total engine	333,830 lb.	326,470 lb.

Total tender	253,900 lb.	217,000 lb.
Total engine and tender	587,730 lb.	543,470 lb.
Wheel bases:		
Driving	13 ft. 10 in.	13 ft. 10 in.
Total engine	36 ft. 9 in.	36 ft. 8 in.
Total engine and tender	78 ft. 1/8 in.	72 ft. 2 in.
Wheels, diameter outside tires:		
Driving	74 in.	79 in.
Front truck	36 in.	36 in.
Trailing truck	55 in.	55 in.
Journals, diameter and length:		
Driving, main	12 in. by 14 in.	12 in. by 14 in.
Driving, others	11 in. by 14 in.	11 in. by 14 in.
Front truck	7 in. by 12 in.	7 in. by 12 in.
Trailing	9 in. by 16 in.	9 in. by 16 in.
Boiler:		
Type	Conical	Conical
Steam pressure	240 lb.	230 lb.
Fuel	Bituminous coal	
Diameter, first ring, outside	78 in.	78 in.
Firebox, length and width	126 1/8 in. by 96 1/4 in.	126 1/8 in. by 96 1/4 in.
Tubes, number and diameter	207—2 in.	251—2 in.
Flues, number and diameter	45—5 3/8 in.	36—5 3/8 in.
Length over tube sheets	18 ft. 8 in.	19 ft.
Grate area	84.3 sq. ft.	84.3 sq. ft.
Heating Surfaces:		
Firebox	228 sq. ft.	228 sq. ft.
Combustion chamber	64 sq. ft.	64 sq. ft.
Arch tubes and syphons	109 sq. ft.	113 sq. ft.
Flues and tubes	3,190 sq. ft.	3,444 sq. ft.
Total evaporative	3,591 sq. ft.	3,849 sq. ft.
Superheating	1,000 sq. ft.	791 sq. ft.
Combined evap. and superheat.	4,591 sq. ft.	4,640 sq. ft.
Tender:		
Style	Water bottom	
Water capacity	13,100 gal.	10,000 gal.
Fuel capacity	15 tons	15 tons
Wheels, diameter	36 in.	36 in.
Journals, diameter and length	6 1/2 by 12 in.	6 1/2 by 12 in.
Maximum tractive force	52,180 lb.	46,841 lb.
Weight proportions:		
Weight on drivers ÷ total weight engine in per cent	61.67	60.54
Weight on drivers ÷ tractive force	3.94	4.21
Total weight engine ÷ combined heating surface	72.71	70.36
Boiler proportions:		
Tractive force ÷ comb. heat. surface	11.37	10.10
Tractive force × dia. drivers ÷ comb. heat. surface	841	798
Superheat. surface in per cent evap. heat. surface	27.84	20.55
Comb. heat. surface ÷ grate area	54.46	55.04
Total firebox heating surface ÷ grate area	4.76	4.80
Total firebox heating surface in per cent evap. surface	11.16	10 52

frame is used with the side sheets welded to the frame, making a smooth finished surface and an attractive appearing tender. The tenders are equipped with water scoops as on previous 4-6-2 type locomotives.

Some modifications have also been made in the design of the boilers of the new locomotives. The diameter at first course of 78 in. outside has been retained, also the same sheet thickness of 13/16 in. On account of the 10-lb. increase in boiler pressure, the tapered second course thickness was made 29/32 in. instead of 7/8 in., while the third course was changed from 7/8 in. to 15/16 in. A larger superheater is employed having 45 instead of 36 units, while the number of 2-in. tubes has been reduced from 251 to 207. The superheating surface is 1,000 sq. ft. instead of 791 sq. ft. The length over the tube sheets has been reduced from 19 ft. to 18 ft. 8 in. The grate area remains as before at 84.3 sq. ft.

The driving-wheel base of the new 4-6-2 type is the same as on previous Pacifics, viz.; 13 ft. 10 in. The diameter of the driving wheels can be increased in the future, if desired from 74 in. to 79 in., without great difficulty or expense. The total wheel base is 36 ft. 9 in., which is 1 in. longer than previous engines, due to the use of an engine truck having a 7-ft. wheel base instead of 6 ft. 10 in. Alemite grease lubrication fittings are used on the driving boxes for shoe and wedge fits and hub bearings, and also on the spring rigging.

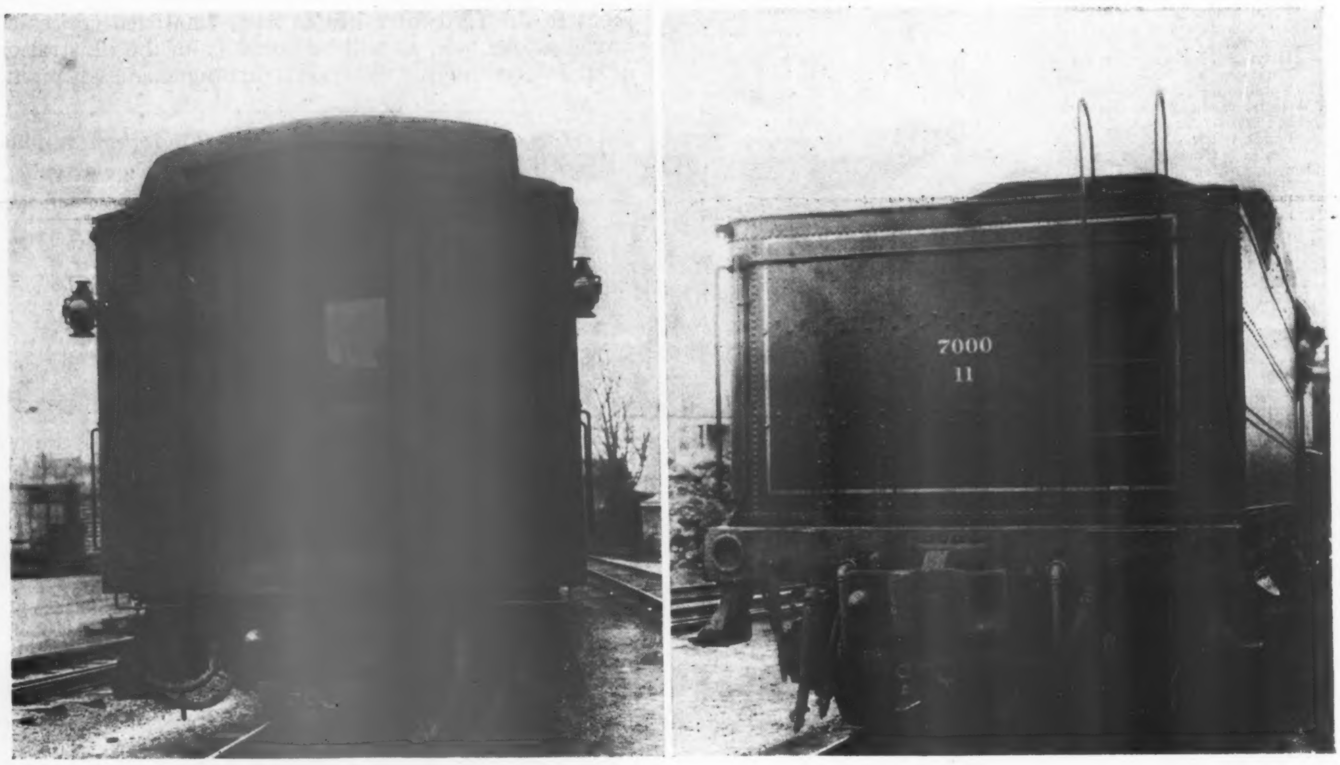
Among the features of special interest is the placing of all piping as far as possible under the jacket, which improves the appearance of these locomotives. Extra heavy copper piping was used for the various pipe lines, such as air lines to the sanders, bell ringer, etc. The pipes to the feedwater heater have also been concealed in the smoke box, as will be noted from the illustration of the locomotive. A special arrangement of piping with cast steel elbows is used where the feedwater piping enters and leaves the smokebox.

Other features of interest include a Westinghouse

(Concluded on page 128)

List of Special Parts, Appliances and Equipment Applied on the New Jersey Central 4-6-2 Type Locomotives

Road	Central Railroad of New Jersey
Builder	Baldwin Locomotive Works
Number built	Five
Firebox and Boiler:	
Blower fittings, smokebox	Barco
Blower valve	Strong Statite
Blow-off cock	Okadee, 2 in.
Boiler check valves	Consolidated
Boiler tubes	Toncan iron, 2 in.
Boiler plate	Lukens, o.h. steel
Feedwater heater	Elesco
Firebox sheets	Worth Steel; Bethlehem Steel
Fire brick arch	General Refractories Co.
Fire door	Franklin, Butterfly
Injector	Sellers, non-lifting No. 12 6/10
Lagging	Johns-Manville
Pipe covering	Unarco Insutape
Rivets	Victor, steel
Safety valves	Star Brass Co.
Staybolts, flexible	Alco
Staybolt iron	Ulster special
Stoker	Standard, modified type B
Syphons, Thermic	Locomotive Firebox Co.
Superheater	Type A
Washout plugs	Huron, corner of firebox and barrel
Water gages	Hanlon, 9-bullseye
Water-gage cocks	Sargent, 2-seat
Whistle	Star Brass Co., 6-tone chime
Cylinders and Running Gear:	
Axles, driving	O.h. carbon steel, medium annealed, A.R.A. spec. hollow-bored, 3 in.
Axles, engine truck and trailer	Hammered, o.h. carbon steel, annealed, A.R.A. spec.
Buffer, radial	Franklin Economy
Crank pins	O.h. carbon steel, annealed
Crossheads, cast steel	American Steel Foundries. Hylastic
Crown brasses, driving box	National Bearing Metal Co.
Cylinder and valve bushings	Eddystone, cast iron
Cylinder cocks	Okadee type E
Drifting valve	Ardco
Eccentric cranks	Forged steel
Engine truck	General Steel Castings
Frame bolts	Ulster, refined iron
Frames, main	General Steel Castings, vanadium steel
Front bumper	General Steel Castings
Packing, piston-rod and valve-stem	King Metallic
Packing, rings, piston and valve	Hunt-Spiller gun iron
Power reverse gear	Alco
Rods, main and side	O.h. carbon steel, medium annealed
Rods, piston	O.h. carbon steel, medium annealed, hollow bored.
Sanders	King, double type
Springs	Crucible Steel Co., chrome silico-manganese steel
Tires, driving and truck	Midvale, o.h. steel
Trailing truck	General Steel Castings, Delta type
Cab:	
Bell ringer	Transportation Devices Corp
Clear-vision window	Central Railroad of New Jersey
Gage, steam	Ashcroft, 6 3/4 in.
Lighting equipment and generator	Pyle-National
Throttle	Bradford, Chambers backhead type
Miscellaneous:	
Air brakes	Westinghouse, E. I.
Coupler, pilot	National Malleable Castings
Flexible engine tender connections	Barco
Lubrication, grease, for springs, spring rigging, shoes and wedges and driving box hubs	Alemite
Lubricator, mechanical	Detroit, 16-feed, 32 pints
Pipe unions	Corley
Pipe, flexible joints, air, steam	Barco
Steam-heat reducing valve	Leslie
Steam-heat coupler, rear of tender	Gold, 804 S
Tender:	
Axles	Hammered carbon steel
Clasp brakes	American Steel Foundries
Springs, elliptic	Crucible Steel Co., chrome-silico manganese
Tank plates	Copper-bearing steel
Tender coupler	National Malleable Castings, 6 in. by 8 in.
Tender draft gear	Miner friction, A-5-XB
Tender frame	General Steel Castings, water bottom type, cast steel
Tender trucks	General Steel Castings, four-wheel type, cast steel



Passenger car and tender with the O-B Tight-Lock Coupler and train-line connections

Baltimore & Ohio Tests Coupler Equipment

A report of the progress made in the development of an automatic "tight-lock" car coupler for passenger-train service in which steam, air and electric train-line connections have been incorporated

THE Baltimore & Ohio has been testing the O-B Tight-Lock coupler in passenger train service since December, 1928. This coupler, a description of which appeared in the Railway Age, Daily Edition, June 20, 1928, page 1420, is manufactured by the Ohio Brass Company, Mansfield, Ohio. These tests are being conducted to develop an automatic tight-lock coupler which will inter-couple with all existing couplers and provide automatic connections for the steam, air brake, air signal and electric systems. It is the desire of those in charge of this development work to combine all these connections between cars in one structure, so that when the car couplers are unlocked, the valves in the steam and air signal line will close automatically and at the same time open the electric circuits. This article is a report of the progress which has already been made. Further tests of this equipment are contemplated.

Results thus far obtained with a train of three passenger cars and a tender equipped with the O-B Tight-Lock coupler and the automatic braking and service connections indicates, aside from certain minor changes, that the design of the coupler is based on sound principles.

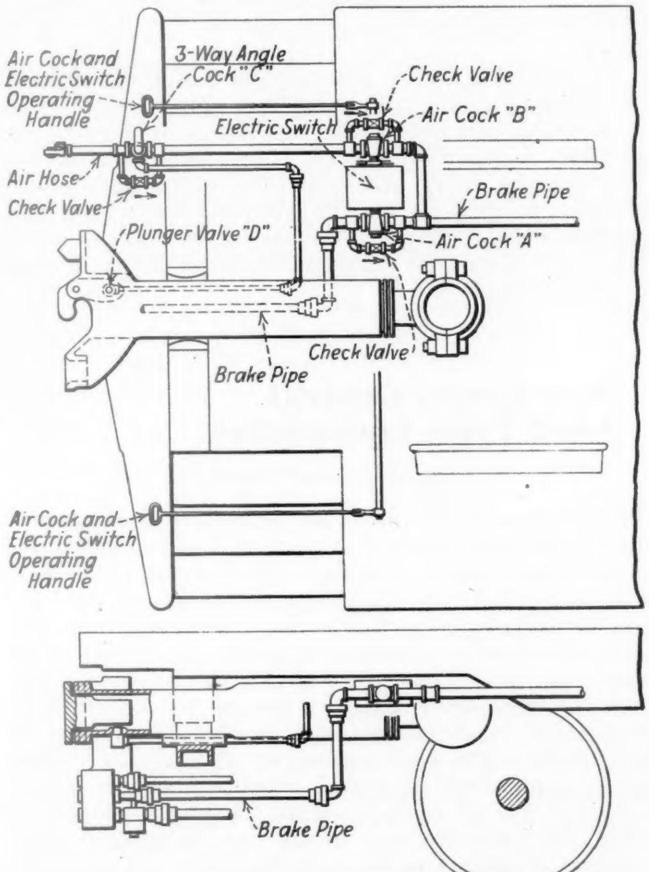
The Design of the Coupler

The O-B Tight-Lock coupler is designed to secure a rigid connection between coupler heads when coupled. The method employed is an adaption of the principle of the Miller hook couplers which the Ohio Brass Company has supplied extensively to electric railways. Lateral wings of the pin-and-funnel type on the coupler head are so designed that, as the coupler knuckles engage the opposing guard-arm faces, the wings are brought into register. When the opposing faces of these wings are in close contact, the pin-and-funnel connections hold the heads immovably alined with respect to each other, and the knuckles are locked by a spring-actuated wedge lock which moves forward in the coupler shank. The lock spring is proportioned so that its action is faster than the recoil of the mass of the car even under collision shocks. The "making" of the coupling is thus assured under any conditions which bring adjoining coupler heads together, and the knuckles may therefore be left in the open position when not coupled.

Inasmuch as a rigid drawbar connection between

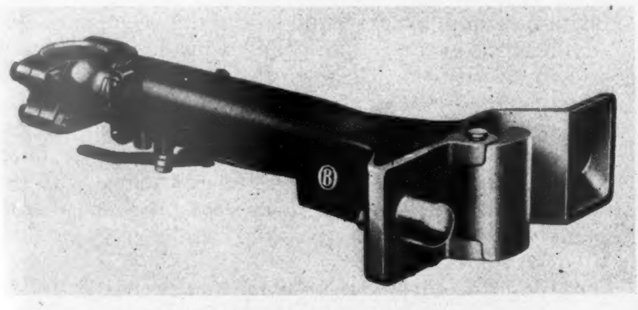
adjoining cars is obtained, suitable provision must, therefore, be made for universal angular movement between the drawbar and the car body, as well as for some tortional movement between adjoining cars. This is provided for in a ball-and-socket anchorage to the underframe, a method of attachment thoroughly established in electric railway practice.

The shank of the O-B coupler contains its own draft



Arrangement of brake-pipe connections where the automatic connector head is carried by the coupler

gear which eliminates the necessity of separate draft-gear connections for the coupler. This coupler also locks the cars together so that in the event of a derailment

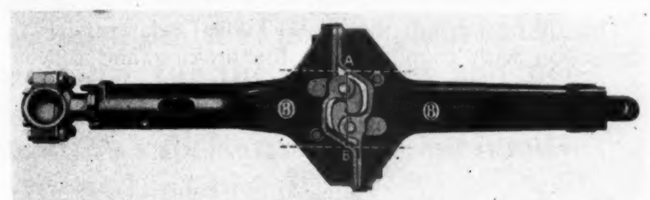


The O-B Tight-Lock coupler

it would be practically impossible to separate them unless the couplers themselves should be broken. This feature helps to prevent one car from telescoping another in the event of a collision, because the coupler when coupled acts as a beam under the end sill platform of adjacent cars. There is also an additional safety feature, if the truck should for any reason leave the track or the coupler travel laterally beyond its predetermined distance. This movement opens a check valve to the atmosphere and causes an emergency application of the brakes to the entire train.

With the rigid alinement of the heads of the tight-lock couplers on impact, the coupler heads themselves become suitable supports for connector heads to carry both hose and electrical connections. For passenger service, the connector blocks are designed to carry signal, brake-pipe and steam-heat ports, and a wide scope is provided for the arrangement of electric-circuit contacts.

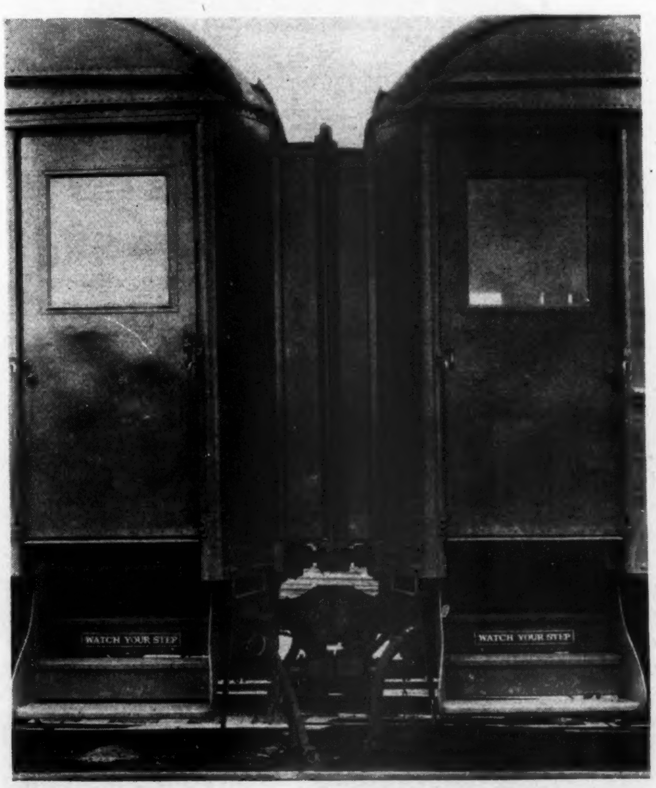
An accompanying drawing shows the arrangement of brake-pipe connections where the automatic connector head is carried by the coupler, which has been worked



The standard A. R. A. contour is indicated by the portion of the coupler between the lines A and B

The coupler on the left has the enclosed friction-ring type draft spring and ball anchorage. The coupler on the right is designed for use with various types of friction draft gears now in service.

out to make unnecessary the use of an adapter for interchange with cars fitted with the usual hose connections. The end of the brake-pipe is divided into two branches, one of which leads to the connector head in the train. Each car is equipped with an air-cooled transformer of 1.5-kw. capacity which reduces the lighting voltage to the standard 32 volts. The electric



Passenger cars coupled with the O-B Tight-Lock coupler and automatic brake-pipe connections

connections between the tender and the several cars in the train are also made automatically.

The O-B Tight-Lock coupler eliminates the necessity for employees going between or under cars to perform

coupling and uncoupling operations. In addition to the value derived from the prevention of telescoping of cars as explained in a previous paragraph, the rigidity of the connection provided by the O-B Tight-Lock coupler prevents vertical play between cars, allowed by the ordinary coupling arrangement. It has been found that this effectively overcomes excessive oscillating movements so that cars ride more steadily which in turn contributes to greater ease and more comfort for passengers when trains are negotiating curves. There is also an appreciable reduction in weight as compared with the equipment in general use.

Central Current Generation

The utilization of the O-B Tight-Lock coupler in connection with couplings for the braking and service lines, as well as electric circuits permitted and simplified the application of what is considered to be the first alternating current system ever applied on railway rolling equipment. The railroad desires to supplement, and under certain conditions supplant, present lighting systems and provide a continuous source of electrical energy in sufficient quantity to provide for the operation of air-conditioning equipment, elecrtic refrigeration, vacuum cleaners, hot water heaters, cigar lighters, window operating devices, coffee percolators, etc.

Front-end view of the Baltimore & Ohio locomotive showing the central generating unit

The system being tested consists of a 25-kw., 220-volt alternating current steam turbo-generator of the self-regulating and self-exciting type mounted on the front end of the locomotive under the smoke box. Steam for the operation of the turbine is supplied from the locomotive and no additional duties are imposed upon the engineman except that of opening or closing the steam-supply valve. A voltmeter has been installed in the locomotive cab.

Alternating current at 60 cycles and at 220 volts is conveyed from the turbo-generator to the several cars and the other to the standard air hose. The latter is fitted with a three-way angle cock at the sill and, in addition, there is an air cock in each line. The two latter valves are interconnected and operated by the same handle so that when one is open the other is closed. The drawing also shows an application for electrical connections in which the cut-out switch for the electrical leads to the connector is also operated by the air-cock handle.

It is believed by the management that this system of practically continuous lighting- and power-supply offers promise of overcoming the capacity limitations of the existing intermittent supply from the axle-generator system using either belt or positive drive, and appears to offer promise of making available necessities, conveniences and comforts in railway travel, many of which have heretofore been unattainable due to the inadequacy of power supply.

New Jersey Central 4-6-2 Type Locomotive

(Continued from page 125)

pedestal-type brake valve, the pedestal being mounted on a substantial bracket secured to the bottom of the back boiler head; a modified type B Standard stoker, hollow-bored piston rods, a special bracket of rigid design to support the distributing valve and eliminate pipe failures due to vibration, and a special design of heavy four-wheel cast-steel tender truck. This truck provides easy riding qualities for the tender. A tube is inserted in the tender and welded in position to hold the fire tools when not in use. All internal bracing of the tender-tank is welded instead of using the conventional type of rivets to secure the brace plates.

Of particular interest is the use of solid floating bushings of bronze in the main-rod back end and side-rod main-pin connections, instead of the three-piece floating bushing used on the previous engines.

The perforated type of cast-iron grate bar has been applied on these engines, which is supported on cast-steel side and center-support frames. The exhaust ports were enlarged and the steam lap reduced ⅛ in. as compared with the previous 4-6-2 type, which changes have already shown marked savings in fuel consumption and have resulted in a much smarter engine in starting trains. The changes in ports and steam lap together with the use of a 45-unit superheater, has shown a saving of 6 per cent in fuel consumption.

Aside from the changes noted, the general design of the new locomotives follows closely along the lines of their predecessors. The New Jersey Central emblem attractivey striped in gold leaf appears on each side of the tenders. The locomotive and tender are painted in Nile Green.

The design of these locomotives was prepared under the supervision of the mechanical department of the railroad.

FIFTY YEARS AGO.—The Denver & Rio Grande [now the Denver & Rio Grande Western] has contracted for the construction of 144 locomotives with a single builder, the cost to aggregate about $1,000,000. This is probably the largest contract for locomotives ever made and is an evidence of the rapid growth of this remarkable narrow gage enterprise.—Railway Age, January 20, 1881.

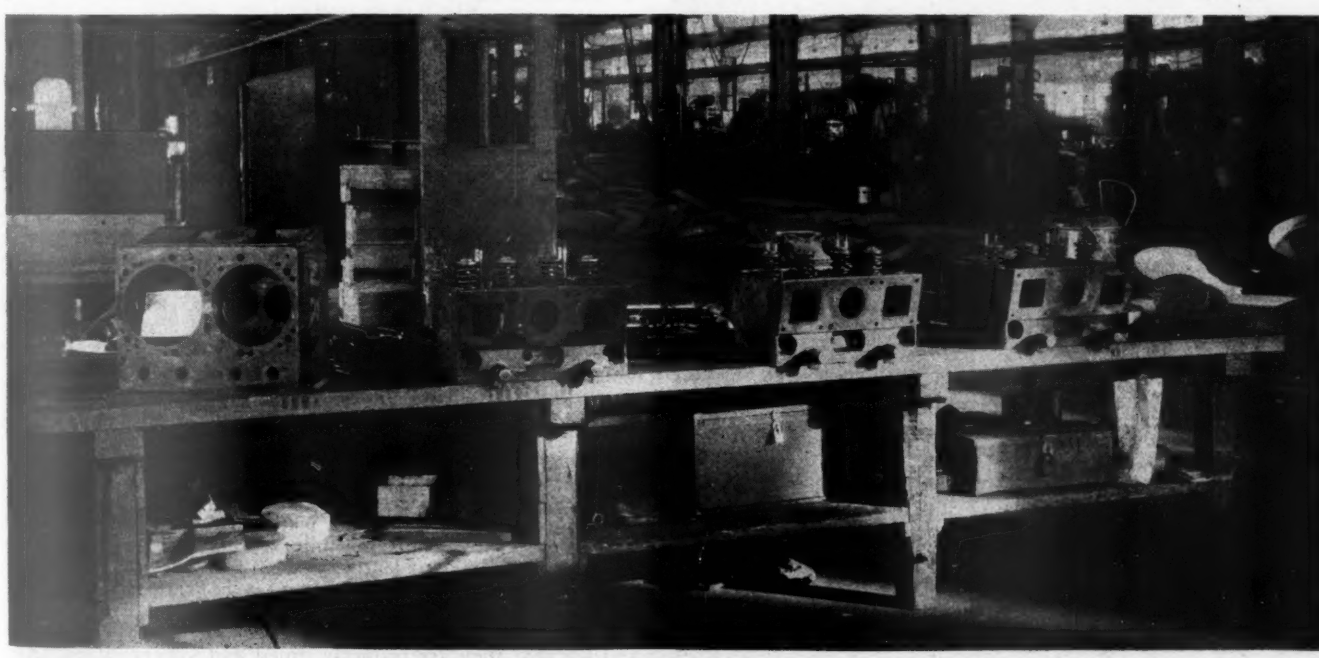
Maintaining Burlington Motor Rail Cars

Heavy repairs on 57 gas-electric cars are centralized at the two main shops of the road where special devices are provided to save time and insure accuracy of operations on the power plants. Responsibility for the condition and performance of the equipment in service rests with a superintendent of automotive service and his supervisors

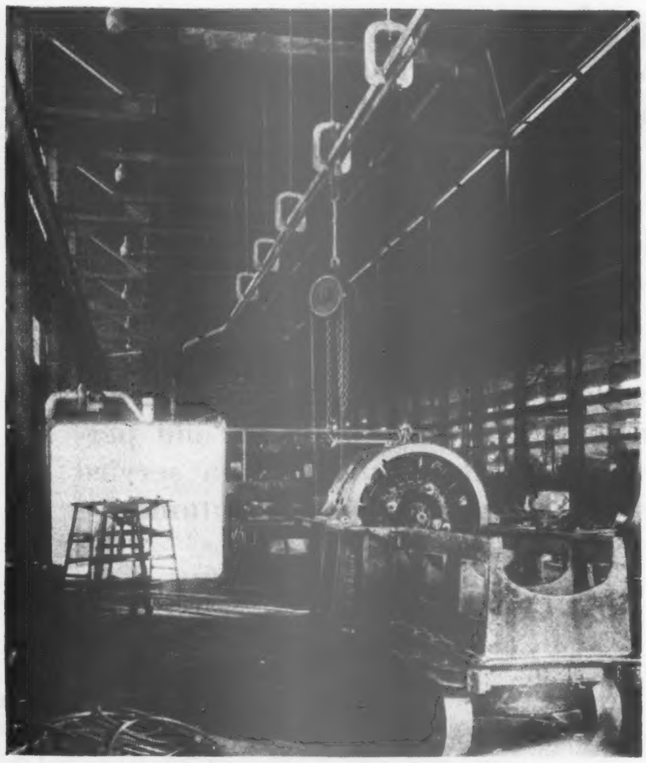
THE Chicago, Burlington & Quincy was one of the first roads to appreciate the possibilities of economy and reduced operating expense due to the replacement of steam service by motorized equipment, which saved fuel and water costs, crew expense, locomotive-maintenance cost, engine handling at terminals, fuel standby loss, cinder-handling expense, and, at the same time, permitted giving better service to the territories served by the Burlington. In addition to seven gas-mechanical cars, the Burlington now operates a total of 60 gas-electric cars in passenger-train service, including two on the Colorado & Southern and one on the Wichita Valley. The 57 gas-electrics on the Burlington proper made 3,341,004 miles in 1930, demonstrating a high degree of availability and economy. Making allowance for out-of-service time due to traffic and causes other than disability, the availability of these cars was 94.0 per cent. Almost 60 per cent of the motor-train mileage was made with trailer equipment, either one or two cars. The cost of gasoline, fuel and lubricating oils per mile was 6.11 cents; repairs, labor and material, 5.03 cents; and total operating expense, 27.04 cents. Allowing 6 per cent interest on the investment and a generous depreciation rate of 8 per cent, these gas-electrics, as shown in one of the tables, earned 28.5 per cent on the investment in 1930 and saved $699,290, or 36.3 per cent of the cost of equivalent steam-train service.

Burlington gas-electric cars are all used in passenger train service, handling passengers, baggage, express, milk and mail, on both branch and main lines. This type of equipment is used to a greater or less extent on practically the entire lines east except between Chicago, Ill., and Aurora; La Crosse, Wis., and St. Paul, Minn.; Kansas City, Mo., and St. Louis. With the exception of two runs by cars on the Colorado & Southern Wray, Colo., and Ravenna, Neb., mark the limit of the present extension of gas-electric operation on the Burlington towards the west. Twenty-one cars are used in main line service. Forty-four cars are equipped for handling railway mail; nearly half of the cars carry express and baggage, but no passengers; none of the power cars carry passengers only.

A study of the power capacities of gas-electric cars on the Burlington shows that there are 14 cars equipped with Electro-Motive, eight-cylinder, 400-h.p. power plants; 43 Electro-Motive, six-cylinder, 275 h.p. power plants; one Brill-Westinghouse, six-cylinder, 250-h.p. power plant; one Electro-Motive, six-cylinder, 225-h.p.



Bench where cylinder heads and other parts are repaired



Gas-electric repair department at West Burlington shops

power plant, and one Mack, 240-h.p., dual-power plant. Nine of the cars are provided with Westinghouse electrical equipment and 51 with General Electric. Seven cars have double-end control, for operation in either direction without turning.

How Light Repairs Are Handled—Few Failures

Light repairs given to the rail motor cars at all terminal and layover points include changing cylinder heads, grinding valves, applying new ignition cables, adjusting bearings, cleaning electrical equipment, installing new rings in air compressor, testing air equipment, changing brake shoes, beams, etc., and renewing any parts necessary. Special attention is given to the condition of trucks and wheels and flange-oiling equipment. Wheel wear is dependent upon a number of circumstances, including the severity of the service and track conditions. In general, wheels make about 35,000 to 45,000 miles before wheeling-truing brake shoes are used to cut down the high flanges, afterwards being trued about every 6,000 miles until the next general shopping. In case of accident or necessary wheel removal for turning, a reserve power truck held at the general shop is applied, thus permitting the car to continue in service. The cars are refinished by painting on the average of about every two years. The front ends of the cars are painted red and yellow to attract attention at road crossings and so that they can be seen at a greater distance by trackmen.

A stock of parts is carried at all maintenance points from the general store at Aurora, which makes all battery repairs and reclaims all crank-case oil, after 1,500 miles of service, by the distillation process, at a cost of 11.2 cents a gal. as compared with 42 cents new. As necessary precautions due to the use of gasoline fuel, the cars are assigned to enginehouse stalls where fires and open flame lights can be kept away. No welding is permitted about these cars and all maintenance forces are instructed in the safe handling of the equipment. No operation of the engine in closed buildings is permitted.

As is to be expected from the high percentage of availability, failures of gas-electric cars are few and far between. There were only 21 failures with 57 cars, making a mileage of 3,341,004, in 1930, or approximately 160,000 miles per failure. Another way of expressing it would be .031 failures per car per month.

The following is a typical failure report for the month of November, 1930:

Car No. 9727, Creston Division, Lost 1 Hr. 53 Min., November 1

Failure was attributed to connecting rod breaking in the crank end of rod, due to an existing fracture.

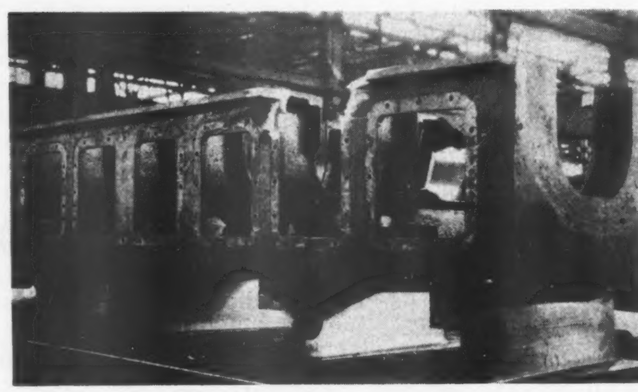
A sample of oil was taken from the crank case after failure occurred. Analysis showed oil to have a very dark appearance, which is evidence of considerable use between oil changes. It has been noted that the bearing of No. 3 rod which failed had been taken up the previous night and possibly pulled up too tight. This, together with the poor condition of the lubricating oil, probably resulted in the bearing becoming hot and gripping the crank pin, due to lack of proper lubrication, causing the rod to fail at point of fracture.

This failure can be attributed to a combination of conditions, which could have been avoided if the following precautions were taken:

Extreme importance of careful inspection of reciprocating parts.

Changing out lubricating oil regularly in order to avoid excessive use and dilution.

Connecting rod crank pin bearings should not be pulled up too tight, but a clearance of .003 in. to .005 in. allowed on the diameter and a lateral clearance of .020 in. equally divided.



Upper half of a broken aluminum crankcase casting which was repaired by welding

Motorman reports that he noticed an unusual sound in engine immediately after leaving the terminal, but he continued operation in this condition for some time before failure of rod occurred. Had he stopped when the unusual sound was first detected and made careful inspection, he probably would have located the trouble, after which a relief engine should have been called and an expensive failure avoided.

Car No. 9811, Lincoln Division, Lost 3 Hr. 55 Min., November 8

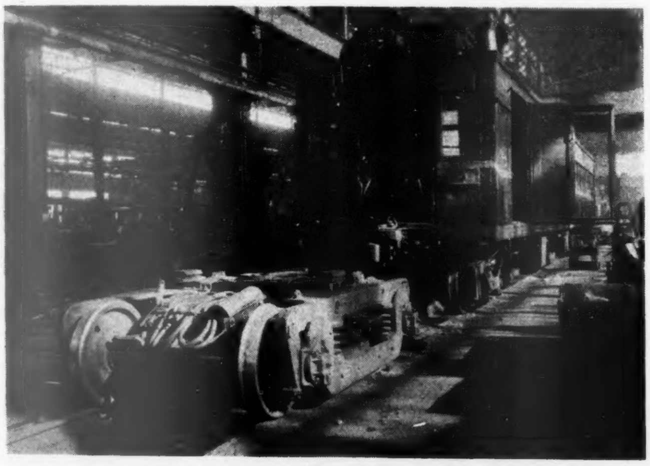
Failure due to piston breaking in No. 3 cylinder. It is impossible to make inspection of pistons unless cylinder head is removed and piston pulled. Fractures in piston are most times produced by detonations caused by pre-ignition and by excessive heating of engine due to overload. Incorrect proportions of fuel components will also contribute to detonation by causing violent explosions when ignited, instead of merely burning under high pressure as when properly proportioned. Detonation from this cause can be somewhat diminished by supplying water to the carburetors which injects a spray of moisture into a fuel mixture. This application has been made to a few of our cars in service, resulting in smoother operation and a considerable reduction in detonation.

Where detonation is present, check up on the magnetos and see that they are properly timed and synchronized. Also make sure that the power plant is not overloaded on account of excessive trailing load.

Maintenance Policy and Organization

The success of the Burlington in using gas-electric rail equipment may be attributed to its general policy of effective inspection and maintenance. The car inspection and maintenance forces are all on the mechanical-department payroll, reporting through their respective foreman, master mechanic or shop superintendent and superintendent of motive power to the vice-president of operation. Co-operating fully with the mechanical department, and also reporting directly to the vice-president of operation, is a rail motor car supervisory organization, comprising a superintendent of automotive service, general field supervisor and four district supervisors, who are responsible for the condition and satisfactory performance of automotive equipment on the road. In addition to instructing and training maintainers and enginemen, this supervisory organization keeps records of individual car performance, decides when cars need shopping for heavy repairs and passes on the quality of repair work done at the shops.

The superintendent of automotive service makes recommendations regarding the details of new gas-electric car specifications, repair operations, tolerances, standards, etc. The district supervisors have access to



Gas-electric car undergoing heavy repairs at West Burlington shops—The engine and generator are removed

the shops and inspection points to see that the work is properly carried out and inspect and pass on all repair work before the cars are delivered to the transportation department.

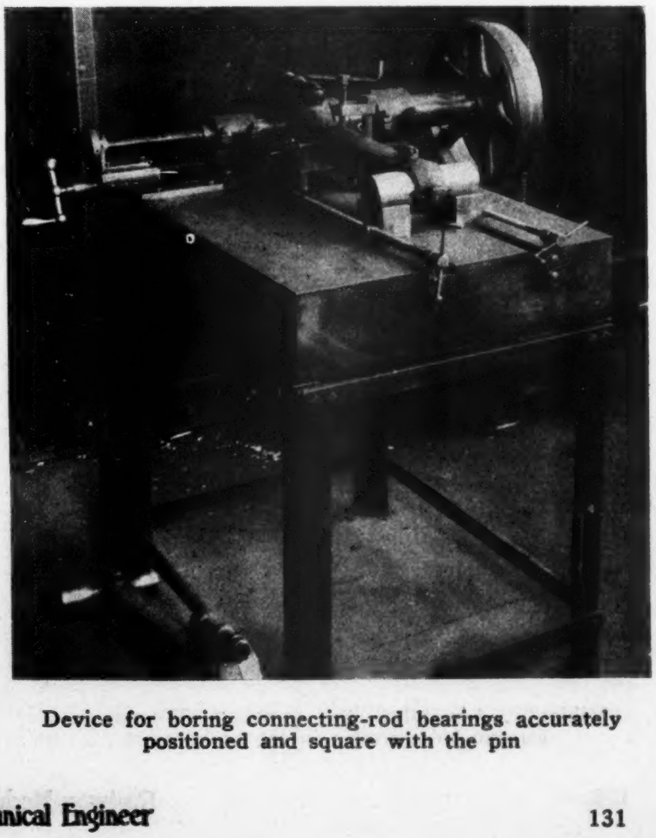
The advantages of this supervisory organization, as developed on the Burlington, include a centralization of responsibility for the proper inspection, maintenance, distribution and assignment of gas-electric cars; direct action in case of emergency; district supervisory force unhampered in determining facts and reporting them; consequent prompt correction of any undesirable conditions, and the tendency to assure a consistently high standard of inspection and maintenance work.

Three printed forms, or reports, only are used in connection with the rail motor equipment on the Burlington. No. 1659 is a maintenance record card, 8 in. by 9½ in., carrying on one side instructions regarding the details of 24 important operations in connection with rail-car maintenance. In general, these directions govern the frequency of inspections, lubrication and mechanical attention, and, under each, space is provided to enter the date, condition of work done, and initials of the employee performing the work. This card, which carries on the back a record of daily battery inspection as well as complete directions regarding the kind of lubricants to be used on various parts of the rail cars, is carried in a holder in the cab for the information of district supervisors or other interested officers who can tell at a glance just what kind of attention important parts of the car are receiving. At the end of the month, the car is forwarded to the supervisor of automotive service.

Daily work required on this maintenance record, besides testing the gravity and flushing batteries, includes checking the oil level in traction motor bearings and greasing the pump shaft. Bi-weekly operations include greasing the generator bearings and oiling the air compressor. Weekly work includes adjusting valve tappets, cleaning controller contactors, checking oil pipes, teasing journal and traction motor packing, cleaning magnetos, distributors, spark plugs, etc., and checking the entire equipment for loose bolts. Twice a month it is necessary to clean and check the generator, exciter, traction motor, commutators, brushes and holders.

Monthly, it is necessary to check and clean the carburetor screen and nozzles, grease the centerplates, and check the throttle, air starter and all wiring connections. Certain operations are performed on a mileage basis. For example, the engine oil is changed every 1,500 miles, gears lubricated, engine bearings examined, magnetos oiled, etc. Every 12,000 miles, the crank case is washed out with kerosene, and every 20,000 miles, the waste is removed from the traction-motor armature and axle bearings. The oil in the air compressor is changed every six months. Certain other operations are done when necessary, including the inspection and renewal of water-pump packing and draining and washing out the radiator.

A weekly statement, Form 1661, showing cars held out of service for repairs, is made by the master mechanic and sent to the supervisor of automotive service, with a copy to the superintendent of motive power. This statement gives a current report of the condition



Device for boring connecting-rod bearings accurately positioned and square with the pin

of cars and also affords a record of failures, time lost, etc. The bottom part of the report is devoted to a list of material needed for the maintenance of power rail cars and is of great assistance to the stores department in assuring the prompt delivery of material.

The third report, Form 1660, is an inspection report made monthly by the district supervisor for each car in service and shows the result of his inspection of 20 important details. The nature of any repairs necessary during the month are recorded, as well as the name of the maintainer who did the work. This report is mailed to the office of the supervisor of automotive equipment, with a copy to the division master mechanic for his information. A supplementary work report is also made out by the district supervisor in advance of all general shopping of cars. The general policy of the Burlington in regard to shopping for heavy repairs is to keep the cars in service until the cost of running repairs becomes excessive and the engine and electrical equipment requires a thorough overhauling. The mileage may vary between 150,000 and 230,000 accumulated in a period of 18 months to two years, depending upon the severity of the service and track conditions on the divisions where the cars operate.

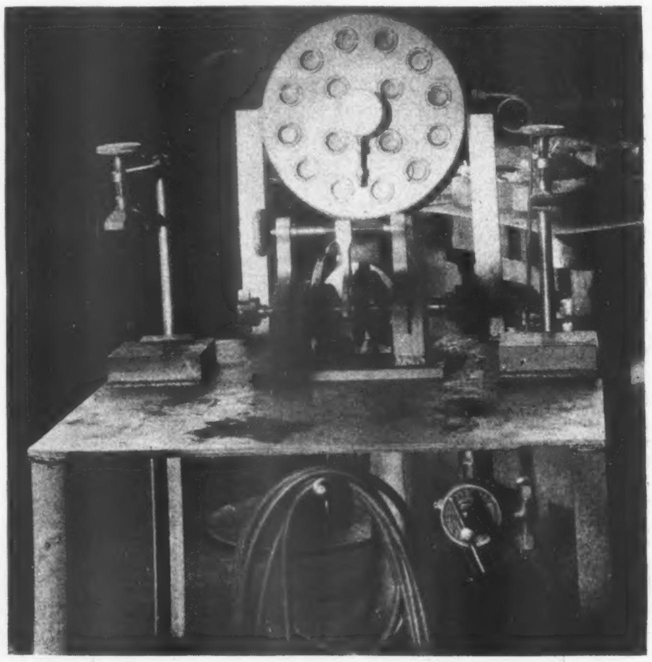
The most severe service in a gas-electric car is sustained by the prime mover and, about one month before the supervisor of automotive service determines from reports that a general overhauling of the power plant and car is desirable, the mechanical department is notified of the desired shopping date, with a copy to the transportation department, which arranges for replacement of the car and its movement to the shop. The mechanical department is also given a detailed report of the work necessary and the material needed for replacement or repairs. A copy of this report is sent to the stores department sufficiently in advance of shopping of the car, thus assuring minimum delays on account of waiting for material.

About 42 of the gas-electric cars operated on the Burlington are given heavy repairs at the West Burlington (Iowa) shops on Lines East and 15 at the Havelock shops on Lines West. At West Burlington shops, these cars are handled one or two at a time on a 10-day schedule, working the following specialized force on two eight-hour shifts daily: Five machinists, two pipe fitters, one electrician, one truck man, one helper and one car man days, and one machinist and two helpers nights. Their work is directed so that two shifts will work on those operations which take the longest and prove the limiting factor in the length of the shopping. Work on the rail cars is segregated, the cars being run in on a track adjacent to the corner of the shop where all gas-engine and electric repair operations are carried on. The only special equipment required for this work, aside from special jigs and devices used in machine operations, is a mono-rail trolley and chain hoist for handling the engine, and a Westinghouse electric oven for baking various parts of the electrical equipment.

"Miking" a 4-in. alloy steel camshaft—Westinghouse electric baking oven in the background

How Heavy Repairs Are Handled

When a car is taken in the shop for overhauling, the power truck and all power equipment in the engine room are removed, thus affording opportunity for complete inspection and overhauling without being cramped for room. One machinist and one electrician disconnect the generator cables and remove the exhaust pipes and shrouds, as well as the piping and throttle assembly. This takes about two hours, being done by the night shift. The day gang then removes the engine base bolts, jacks up the engine, pushes it on rollers out to a platform where it can be picked up by the crane and delivered on the shop trailer to the gas-engine repair gang.

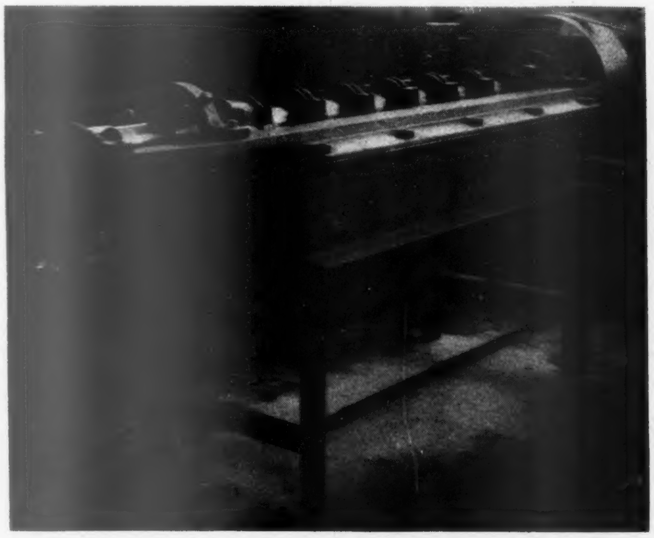


Magneto testing device used at West Burlington shops

The engine is entirely dismantled so that all parts may be inspected for wear and defects. The four-inch alloy-steel crankshaft is calipered for wear and a record kept, bearing surfaces being refinished by turning if cut or more than .006 in. out of round. It has not been necessary to set a wear limit yet, in view of the fact that these cars are still comparatively new. The crankshaft is swung in an engine lathe and tested with a portable micrometer gage for straightness.

Cast-iron cylinder liners, 7½ in. in diameter, are

measured with inside micrometers. In case of excessive wear, it must first be determined whether this is on the piston or the liner. If the liner is out of round or worn in excess of .012 in. a new liner is applied, being pressed in on a rubber gasket to assure that it is watertight and held down by the cylinder head. It is planned in the future to grind the liners in step sizes by .040 in, for oversize pistons. It is also planned to refinish worn pistons by grinding and use them with new undersize liners. In this way, two wear periods will be secured from all liners, as well as all pistons. It is seldom possible to make any reuse of the piston rings. Rod bearings are checked for size and alinement, only .030 in. sideplay being permitted, and all bearings closed and rebored to .004 in. play.

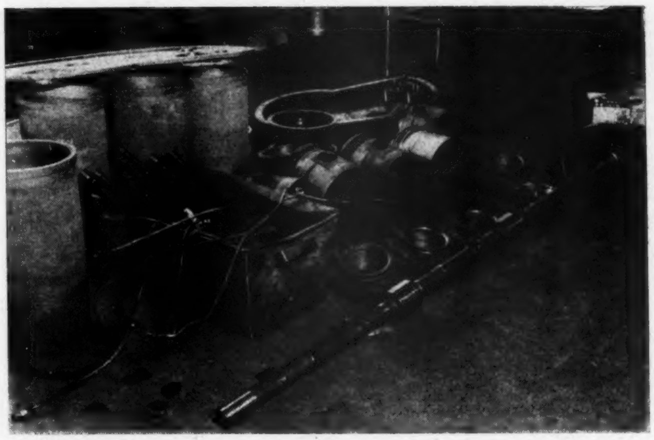


Boring bar for finishing main crankshaft bearings in accurate alinement and in a fraction of the time required by hand scraping

Main bearings are handled in the same way as it is found that a fitting closer than .004 in. tends to promote hot bearings and attendant difficulties.

The cylinder heads are examined for cracks and defects, water jackets cleaned in a lye vat and washed out with a 10-per cent solution of muriatic acid. A soda-ash rinsing water is then used to neutralize the acid. Cracks between the valve ports are welded with the oxyacetylene torch, using a cast-iron welding rod. In cases where the valve seats (exhaust) are beaten into the head, owing to excessive temperatures, alloy-steel seats are inserted by counterboring and setting them 1/32-in. below the surface of the head, which is subsequently peened over. Valve-stem guides are checked and allowed .012 in. clearance on the exhaust and .008 in. clearance on the intake valves. The valve guide bushings are renewed if necessary. Valve springs are checked for tension and length and are rejected if less than 4⅜ in. or over 4¾ in. Valves are checked for straightness and, if necessary, heated and straightened in a special jig. All valves are ground in, using a Valvo grinding machine, until the outer edge is within 1/32 in. of the top of the valve, when the valve is scrapped. Difficulty is seldom experienced due to valve-stem wear. When the valves are scrapped, the stems are used to make chisels and are in great demand for this purpose by shop men.

Rocker-arm bushings and shafts are renewed. The camshaft is checked for wear; also the bearings. Timing gears are checked and renewed if they will not go another shopping. The water pump is dismantled and the packing renewed; also the shaft, if necessary. The oil pump is dismantled, inspected for wear and air leaks. The crank case is thoroughly cleaned, sand-blasted and painted on the inside. Oil feed lines in the engine base are tested and welded if necessary, to assure tightness. The engine is then reassembled with new gaskets throughout. The exhaust manifolds are checked for warping and, if necessary, ground. Roller plugs and bushings for the valve lifter are checked. The indicating micrometer is used on the flexible coupling between the engine and generator to line up the armature shaft with the engine crankshaft.



Camshaft, pistons, connecting rods, cylinder liners, etc. removed from a gas engine

Electrical Equipment

The generator is thoroughly cleaned and painted with an insulating varnish. The commutators are turned down, if worn. Windings of armature and fields are given insulation tests, as are those of the fan motor and air-compressor motor.

Traction motors are dismantled, cleaned with gasoline or tetro-carbonchloride and the armature thoroughly dried for four hours at a temperature of 200 deg. F. The armature is then removed, dipped in a baking varnish and allowed to drain for two hours, then being put in the oven and baked for 12 hours at 200 to 250 deg. F. The commutators are turned and undercut with an electrically driven machine or undercutter. Armature shaft bearings are examined for wear and usually require renewal. The field coils are varnished, dried and reassembled. All electrical equipment is inspected and cleaned. The magnetos are removed and tested for strength with a Wiedenhoff instrument, magnets being recharged and brought back to normal strength. Storage batteries are tested, inspected, and, if defective, sent to Aurora for repairs. In overhauling the cars, all wiring is tested for grounds, and approximately 90 per cent of the ignition wiring is renewed.

Trucks are thoroughly overhauled, new bushings and pins being applied where necessary, as well as springs and wheels. The roller bearings are inspected, cleaned and wicks applied. The air equipment is thoroughly cleaned and tested, as well as the heating plant. The car body is overhauled, cleaned and painted, if necessary, and the power unit reapplied in the car. The generator is connected to the traction motors and controllers, the worn contacts of the latter being replaced, if necessary.

Special Devices and Fixtures

One of the most valuable devices used in connection with the overhauling of gas engines at West Burlington shops is a boring bar for the main bearings. The bar, itself, is 3 in. in diameter, the bore of the bearing being 4 in. The bar is supported on a frame and is belt-driven from an electric motor mounted on a small truck. The bar is adjusted by four set screws in the brass-lined housing. The tools are adjusted by cap screws and set firmly. Being without micrometer adjustment, it is necessary to grind the cutters in an engine lathe equipped with a small tool-post grinder. The feed is arranged so that once the bar is set up, all bearings are bored at the same time, thus assuring an accurate alinement. It takes approximately one hour to grind the cutters and eight man-hours to bore the bearings, including the set-up time, the only additional work necessary being the scraping off of tool marks. Formerly, 80 man-hours were required for the scraping operation. An accurate alinement of the bearings is thus assured in substantially less time than by the former method.

Special Work Called for During General Shopping of Gas-Electric Car No. 9728

Put unions on oil pipes on front end of engine
Renew rocker arm bushings and shaft
Renew cylinder liners, pistons and piston rings
Renew all engine gaskets
Test main oil pipe in crankcase for leaks
Clean gas filter and carburetor
Test magnetos
Adjust all engine bearings
Examine roller plugs and bushings
Examine timing gears
Clean out all oil pipes
Examine oil pump
Clean water jackets
Clean and paint inside of crankcase
Reseat engine valves
Examine starting motor
Test motometer, or thermometers
Install water carburetor
Rebush magneto and water pump coupling
Repack water pump
Examine governors and set speed to 1,050 r.p.m.
Examine crankshaft bearings for out of round
Stop all exhaust leaks
Examine throttle for wear
Clean out water space in cylinder heads

TRACTION MOTORS

Turn traction motor commutators
Varnish armatures
Examine motor bearings
Clean field coils and paint them
Reseat brushes
Examine motor leads

ELECTRICAL EQUIPMENT

Clean and test all electrical equipment
Test all wiring
Turn exciter armature
Sand main generator commutator
Examine fan motor
Examine connections on back of switchboard and solder
Renew exciter field resisters
Clean compressor motor
Clean, test and charge batteries
Test voltmeter
Oil fan in mail room

CAR IN GENERAL

Clean air and test
Examine all brake rigging and repair where needed
Clean both trucks
Examine all wheels and turn if necessary
Install in engine cab, water tank for water carburetor
Examine flange oilers and renew parts if necessary
Test all gages
Renew elliptic springs on front truck
Examine spring hangers; rebush if necessary
Examine all brake pins
Examine drawbars
Overhaul air compressor
Put oil cooler on top of car

The method of boring connecting rods is shown in one of the illustrations, this operation being performed in 1½ hours, as compared with 5 hours formerly required for scraping. The construction of the machine is illustrated. The piston pin is lined square with the body of the machine and the boring bar by means of adjustable V-blocks. Elevating screws are then properly adjusted and clamping screws tightened, the bearing being bored with a two-point cutter, which is a taper fit on the shaft. Again, a more accurate job is secured in a fraction of the time formerly required.

The valve grinder is equipped with chucks for different sizes and grips the valve at two points, thus assuring a valve seat bearing which is square with the spindle. Approximately five minutes per valve is required for grinding.

The magneto tester illustrated is provided for checking clockwise and counterclockwise magnetos used with each engine. The tester is mounted on a sheet-metal table and consists of a friction-disc speed control, clamping arrangement for holding the magnetos and specially-designed head for testing distributor heads under actual working conditions. This head has 16 spark plugs in the back, with lubricator glasses which permit seeing each spark plug while in operation under air pressure up to 60 lb. The testing is carried on with a gradually increasing pressure to 60 lb. to make sure of satisfactory operation under normal conditions. The test is carried on for approximately 30 minutes and any magnetos not showing the desired results are returned to the repair shop for repairs and replacement. Spark plugs are examined and, when the points are burned, the plugs are sent to Aurora for reclamation.

Stug System of Firing Pulverized Fuel

(Continued from page 119)

pipes toward each burner, and on its way mixes with the coal dust conveyed by the worms. The air pipes, which terminate at the burners on the locomotive, are made flexible between the engine and tender by means of ball joints and stuffing boxes, and this arrangement has stood the test of actual service. The air speed in the pipes varies between 50 and 150 ft. per sec., more or less, according to the output of the locomotive.

The conveyor screws are driven by a small fast-running steam engine, which also operates on saturated steam. It is of the three-cylinder uniflow type, with inside admission piston valves, its speed being controlled by varying the degree of cut-off. A governor prevents the maximum speed from exceeding 500 r.p.m. The steam engine is geared to a small fan which supplies the combustion air to the auxiliary burner.

Admission of fuel to the main burners is controlled by varying the number of revolutions of the steam motor (within a speed range of about 1 to 5), and consequently the worm speed and the quantity of fuel conveyed by the worms. The same applies to the supply of air, which is regulated by varying the number of revolutions of the blower or throttling the admission of air. All of the controls are so interlocked as to make them foolproof. Thus the worms cannot be started before the blowers are set to work, and vice versa, so that clogging of the tubes with coal dust can never occur. When the locomotive is worked at less than half its full output, one of the burners is cut out. The nozzle plate of the idle burner is kept cool by a small air current being allowed to pass through it.

[Part II of this article, which will be the concluding installment, will appear in the April issue.—EDITOR.]

ONE HUNDRED YEARS AGO.—Cooper's "Tom Thumb" locomotive, built in America for experimental purposes, was tested on the Baltimore & Ohio on a 26-mile round trip run between Baltimore and Ellicott Mills on August 28, 1830. This trip demonstrated the practicability of the steam locomotive.

A Fight For Your Jobs

ONE of the proposals in the program of the Association of Railway Executives set forth on this page last month, for the accomplishment of which the railroads have united, is "a withdrawal of government competition both through direct operation of transportation facilities as well as indirectly through subsidies." This applies particularly to waterways.

Waterway advocates have for many years been active in endeavoring to commit the United States government to a vast program of inland waterways development, including the construction of canals and the construction of locks and deepening of channels in rivers. These advocates claim that the cost of transportation would thereby be reduced because of the lower rates which can be charged by the agencies operating on public waterways. While these waterways serve directly a relatively small, although economically important, proportion of the area of the United States, it is proposed to spread the benefit of the lower water rates to the entire public by the development of joint rail-water and rail-water-rail routes and rates.

The Inland Waterways Corporation, owned and operated by the United States Government, was created by act of Congress in 1924 to conduct a common-carrier water-transportation service on the Mississippi and Warrior rivers to test the practicability of the development of private common-carrier operation on inland waterways. The intention of Congress, as set forth in the statute creating this corporation, was that the government should turn the corporation over to private hands as quickly as it could be made sufficiently self-supporting. Under the Denison Act, passed by Congress in 1928, railways are required to enter into joint route and rate agreements with water carriers and the Inland Waterways Corporation is now enjoying the benefit of such routes and rates, in direct competition with the railroads in its territory.

What is the economic basis for the success of the inland waterways, in the creation of which, the government has spent many millions of dollars, in their competition with the steam railways? It lies in the fact that the government pays a large part of the total cost of transportation on these waterways and passes it on to the tax-paying public. This situation is illustrated by the Ohio river system which was completed and placed in operation between Pittsburgh, Pa., and Cairo, Ill., in 1929, after an expenditure for the construction of locks and deepening the channel of $103,630,000, with an additional $26,000,000 required for maintenance and operating costs during the construction period.

The direct cost of shipping on the river—all that has to be covered in the rates to the shipper—is about 4 mills per ton-mile. But this waterway annually costs the federal government over four million dollars in interest and about four million dollars more in maintenance and operation of canals and locks, dredgings, etc.—over eight million dollars altogether—which is equivalent to 5.42 mills per ton-mile on the traffic carried. Including, therefore, this hidden cost which the tax-paying public has to pay, it costs 9.42 mills per ton-mile to move traffic over this route as compared with less than 9 mills per ton-miles on the average for a number of railroad lines in this territory. Furthermore, when account is taken of the large increase in the number of ton-miles required to move a ton of freight between two points by water as compared with the number required to move a ton of freight between the same points by rail, because of the winding course of the river, the uneconomic character of the water transportation becomes much more evident.

Most of the traffic is in the hands of industries operating for their own benefit. The public is thus taxing itself in order that it may present to these private shippers one half of their transportation costs. Would it not be cheaper to accomplish this, if it is what the public really wants, by subsidizing the railroads?

Essentially the same situation exists on all other inland waterways which have been artificially created. The true cost, including interest on the investment in and maintenance of the waterways, as well as the expense of boat operation, in every case exceeds the cost of similar service by rail. In the case of the Erie barge canal, owned by the state of New York, the total ton-mile costs—the boatmen's charges plus the costs borne by the state—are nearly twice those charged by the eastern railways.

Aside from the government-owned Inland Waterways Corporation, most of the transportation on inland rivers is privately conducted for private benefit. Surely the railroads are acting in the public interest when they ask for legislation which, among other things, will provide the "opportunity for the railroads to enter this field of transportation under proper supervision but without handicap as compared with other transportation agencies." It is only through such operation, if at all, that the co-ordination of water and rail transportation can be effected.

Railroad men are as much a part of the public as farmers, industrial shippers or any other group. In any discussion of waterways in their communities, let them insist that recognition be given to the hidden costs as well as to the rates charged by water transportation agencies. A general recognition of the true situation will do much to stop this waste of public money on measures which are bound to weaken the railroads and seriously impair their future public service.

EDITORIALS

Safety Valves And Safety

The following question was recently received in the editor's mail: "What are the duties of an engineer when setting a safety valve?".

If there are enginemen who still believe what this question implies, then it is of such serious import, not only to these men themselves, but to all railroad officers, that it should be answered in no uncertain terms. An engineman has absolutely no business tinkering with a locomotive safety valve. The responsibility for the inspection and proper functioning of safety valves is the job of the enginehouse and shop forces. The engineman's duties with respect to defective and inoperative valves should be covered in his instructions. If he obeys his instructions, he will leave them alone.

Slugging Welds

To what extent is the slugging of welds practiced? This practice which consists of placing ends of welding wire, slugs from a punch press, or miscellaneous bits of steel on the surface, or in the hole or V, of the weld and then welding around and over them, is one that should be carefully guarded against. If the weld is a flat surface and is to be machined, the tool of the machine is more than apt to catch in the slug and tear it out of the weld, with an occasional breaking off of the tool. If it is a hole that has been welded and slugged, it is apt to result in broken drills if a hole is to be drilled adjacent to the weld, which is often the case.

In any instance, the slug does not represent a completely welded job and the weld is weaker for it being there. There is no doubt that the practice speeds up the production of the welders, which is advantageous to them if they are employed on a piecework basis. But the advantages stop there. There is no gain or profit in a slugged weld. There is no extension of life of the welded piece. Quite to the contrary, the life of the welded piece is liable to be greatly diminished with the chances favorable for a failure in service.

The Advantages of Temperature Control

One shop process in which the railroads have fallen behind, in comparison with the progress which has been made in other industries, is the heating of metals. In the development of autogenous welding, on the other hand, the railroads have been leaders. This process greatly simplifies many repair operations and has made possible the mending of expensive parts which otherwise would have required replacement. Its application is flexible and it is, therefore, especially adapted to repair-shop operations. Refinements in heat treating most readily adapt themselves to operations for which a systematically conducted routine may be developed and find their most obvious application in production industries.

But that the results of accurate temperature control fully justify the installation of the equipment necessary to effect it in many heating operations in the railroad shop is demonstrated by the results obtained in the Norfolk & Western shops, set forth in an article in this and our preceding issue. This is not primarily because of the cheapening of the processes themselves, but because the resulting uniformity in quality of materials has effected increases in life and a reduction in the volume of work passing through the shop.

This demonstration of the economic advantages of accurate temperature control on materials now in use opens up possibilities for a more extensive application of special steels, the use of which has been retarded by the general lack of facilities and methods for properly dealing with them in the shops.

Individual Versus Group Drives

Practically all of the more modern shops and engine terminals, especially those built in recent years, have been equipped with machine tools having individual-motor drive. However, the question of the economy of individual drive as compared with drives of machines in groups from a single motor of larger capacity was brought up at a recent meeting of the Machine Shop Practice Division of the A.S.M.E. One of the speakers pointed out that 50 two-horsepower motors could not deliver power nearly as efficiently or at as low cost per horsepower as one 100-horsepower motor. He said that his plant had scrapped its individual motor drives at about one-half their value and had purchased large motors to drive groups of machine tools. It was estimated that the new investment would pay for itself in approximately a year and a half.

The wisdom of such a move is, of course, open to argument. Individual-drive motors possess certain advantages which the group-drive motor does not possess. If a machine tool or its motor fails, only one unit is affected. As is frequently the case in railroad-shop practice, the services of all tools are not required all the time. There is no economy in driving one tool with a motor having the capacity to drive a group of ten or a dozen. There is also the upkeep in maintaining belts, drive shafts, pulleys and safety guards which must be considered in connection with group drives.

However, there are departments such as the automatic machine-tool or manufacturing departments in a machine shop where all the tools are in continual operation. In such instances, it might be advantageous to investigate the merits of group-drive as against individual-motor drive.

Railroad Representation On the A. S. A. Council

The announcement in the January, 1931, bulletin of the American Standards Association that L. A. Downs, F. H. Hardin and L. K. Sillcox have been appointed members of the A.S.A. Standards Council is of inter-

est to all mechanical department officers. Mr. Downs, president of the Illinois Central, is to represent the American Railway Association; Mr. Hardin, assistant to the president of the New York Central, represents the Mechanical Division, A.R.A., and Mr. Sillcox, vice-president of the New York Air Brake Company, represents the American Society of Mechanical Engineers. The latter is a member of the Executive Committee, Railroad Division, A.S.M.E., and has been active in the research and standardization work of the society for a number of years.

The work of the American Standards Association has been of increasing importance in the industrial life of this country for many years. The association is composed of forty-five member bodies, which includes seven governmental departments, practically all of the various technical societies, and a considerable number of industrial associations and corporations. The member bodies contribute both funds and technical talent to the work of the association.

The objects of the American Standards Association are to provide a systematic means of co-operation in establishing American standards to the end that duplication of work and the promulgation of conflicting standards may be avoided; to serve as a clearing house for information on standardization work in the United States and foreign countries, and to act as the authoritative American channel in international co-operation of standardization work.

The action of the American Railway Association in joining with other industrial associations and engineering societies in sponsoring the work of the A.S.A., marks an advance step which is in conformity with the trend toward co-operation in matters of common interest among all industries.

Defect Carding For Damaged Sheathing

The new American Railway Association interchange rules, as amended effective January 1, 1931, contain perhaps no more welcome change than that covered by Rule 4 with respect to the damaged sheathing of refrigerator cars. The previous reading of this particular rule, which was no doubt experimental, led to much controversy and unnecessary carding. Parts of refrigerator-car sheathing, bare of paint because of some slight friction, apparently could not be construed as a serious defect with any bearing on safety of operation. A great many car owners were not repairing such defects, some of which, consequently, were of long standing. A rigid enforcement of the letter of the rule, therefore, often resulted in penalizing a railroad which had not caused the original damage to the sheathing. The new wording of this part of the rule will undoubtedly bring immense relief to all interchange points and be a most welcome change. The indications are that maximum benefits from this amendment to Rule 4 are not yet being secured because supervisors have failed, in some instances, to see to it that interchange inspectors are properly instructed in the revised wording and intent of this part of the rule.

In connection with carding for damage caused by a delivering line, Rule 4 seems to be clear that a defect card should be applied to the car at the time and place of damage, or as soon thereafter as possible. But, this is not always being done. Too often, it is left up to the receiving line to demand a defect card and, if they fail to notice the damage, the delivering line is that much ahead. This seems to be the line of reasoning, when, as a matter of fact, no railroad or individual gains in the long run by any such practice. This rule is just as mandatory as any other, and, in these days, especially when payrolls are being reduced, involving the taking off of many receiving inspectors, it is not fair to leave the detection of the damage and the request for a defect card up to the receiving line.

It is a good plan to institute the practice on every railroad to attach the defect card to foreign and system cars for unfair damage immediately at the scene of the accident, because if the car does not leave the line but reaches the repair track, the presence of the defect card on the car tells the repair track foreman the story and much tracing is avoided. Should the car reach an interchange point for delivery off the line, the defect card is attached and the car moves through without burdening the inspectors at that busy point.

Locomotive Fuel Records

Along with many other problems which confronted railroad mechanical departments in 1930 was the necessity of bending every effort to conserve locomotive fuel, and, to the credit of the railroads as a whole, it may be said that satisfactory fuel performances were secured, in spite of a general decline in traffic, which had a very adverse effect on unit fuel consumption figures.

An excellent record was made on the St. Louis-San Francisco, for example, as outlined by Robert Collett, fuel agent of that road, in a recent article published in the Frisco Employees' magazine. Definite objectives are essential for the best results in any line of endeavor and, for 1930, the Frisco set out to obtain a record of 166 lb. of coal for 1,000 gross-ton miles in freight service, 14.5 lb. per passenger car-mile in passenger service, and 140 lb. per switch locomotive-mile in switching service. The actual performances in these three particulars were 163 lb., 15.2 lb. and 144 lb., respectively. The goal was more than reached in freight service in spite of the decline in business, and was credited to the use of generally more efficient modern power and the continued lively interest in fuel economy by officers and employees generally, including enginemen and firemen whose efforts have such a direct bearing on the conservation or waste of locomotive fuel.

While the fuel performance goal was not quite reached in passenger and switching service on the Frisco, the 1929 record in each of these classes was equalled, and Mr. Collett explains that this performance was particularly gratifying and really more of an improvement than the figures indicate because, in passenger service, for example, fuel consumption is calculated on a car-mile basis, and the average number of passenger cars per train decreased slightly, while their average weight increased. Similarly, in yard service, the switching locomotive-mile is based on an arbitrary six

Unit Locomotive Fuel Performance on the Frisco

Year	Lb. per 1,000 gross ton-miles	Cost per 1,000 gross ton-miles
1920	255	0.512
1921	239	0.482
1922	240	0.435
1923	233	0.403
1924	200	0.329
1925	187	0.314
1926	177	0.287
1927	176	0.266
1928	175	0.249
1929	170	0.225
1930	163	0.212

miles per hour, and Frisco switchers did more work per unit in 1930 than in 1929. This is indicated by the fact that switching locomotive-miles decreased about 13½ per cent, while the total freight business decreased only 12 per cent. As a matter of interest, the unit locomotive fuel performance of the Frisco during the past ten years is shown in a table which indicates a decrease in 1930, as compared with 1920, of 36 per cent in pounds per 1,000 gross ton-miles, and 58.6 per cent in cost per 1,000 gross ton-miles.

Considering the railroads as a whole, unit locomotive fuel consumption has now been reduced to a point where additional economies are increasingly difficult to attain. The question of the feasibility of still further improvements, however, is answered each year by the establishment of new records. If these records appear to be only a slight improvement over the previous year, a better perspective can perhaps be obtained by comparing them with the performance ten years previous and remembering that, without the continued interest of railway officers and employees, stimulated by an active and aggressive organization of fuel specialists, it will be very easy to slip back and lose in a short time much of the ground gained by years of patient effort.

Freight Cars Grow Heavier

For many years the trend in the weight of freight cars has been steadily upward. While the fact itself has, no doubt, been generally recognized, little attention has been paid to its import.

Perhaps the reason for this may be found in the fact that the loading capacity has increased almost in exact proportion to the increase in weight. This has held true with but slight variations during the past eleven years. In 1920 the average weight per car of the cars actually moved in trains on the Class I railroads was 20.1 tons. In 1930 the average weight per car moving in trains was 22.2 tons. Within the same period the average capacity of freight cars had increased from 42.4 to 46.6 tons. Assuming that these cars were loaded to capacity, the tare weight in 1920 averaged 32.2 per cent of the gross weight. In 1930 this ratio was 32.3 per cent—an insignificant difference.

But a relatively small proportion of the loaded cars moving in trains are actually loaded to capacity. Consideration of the average car load instead of the capacity load places a different aspect on the situation. Throughout the past eleven years there has been an almost continuous downward trend in the average car load and there is little reason to anticipate any change, unless the railroads are to allow a considerable proportion of their merchandise loading to be taken over by highway trucks. In 1920 the average car load was 29.3 tons and the average tare weight was 40.7 per cent of the gross weight of the loaded cars. In both 1928 and 1929, with the average load of 26.7 and 26.9 tons per loaded car respectively, the tare weight was practically 45 per cent of the total weight in each case, and, with an average load of 26.6 in 1930, it had increased to 45.5.

These ratios, which represent the average effect of increasing weight and decreasing average car load on the operations of the Class I railroads of the United States as a whole, suggest that more attention needs to be given to weight in designing freight cars, particularly box cars, if the gross ton-mile burden of producing revenue ton-miles is not to continue its upward course. The problem of reducing freight-car weight is not an easy one. The demand for increasing strength and stiffness along with the demand for greater cubic capacity for handling automobiles, for instances, can scarcely be accompanied by a reduction in weight without a change in materials or a reduction in the shocks to which freight cars are subject both in switching movements and in long trains. The problem is one, however, to which serious attention needs to be given.

NEW BOOKS

MECHANICAL WORLD YEAR BOOK, 1931. *Published at the office of the Mechanical World, 65 King street, Manchester, England. 534 pages, 4 in. by 6½ in. Price 1 shilling 6 pence.*

Three new sections on power-plant operation, electric railways and electric lamps and lighting, giving a full description of the latest methods and practices used in these branches of electrical engineering, have been included in the 1931 Mechanical World Year Book. Improvements have also been made in the sections on steam boilers, internal combustion engines, belt conveyors, etc.

PROCEEDINGS OF THE INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION. *Wm. J. Mayer, secretary, 2347 Clark Avenue, Detroit, Mich. 120 pages, 6 in. by 8½ in., illustrated. Black board binding.*

This book contains the full report of the thirty-fourth annual convention of the International Railroad Master Blacksmiths' Association which was held at the Hotel Morrison, Chicago, September 23, 24, and 25, 1930. The subjects discussed at this meeting were Autogenous Welding, Carbon and High-Speed Steel and Heat Treatment, Machine and Drop Forging, Spring Making and Repairing, Reclamation, and Safety First.

SHEET STEEL AND TIN PLATE. *By R. W. Shannon, associate member American Institute of Mining and Metallurgical Engineers. Bound in cloth, 6½ in. by 9¼ in., 285 pages, illustrated. Published by the Book Department, The Chemical Catalog Company, Inc., 419 Fourth avenue, New York. Price $5.*

According to the author, this book is intended to assist the layman toward the best and most economical utilization of sheet steel products. It is not a technical book and has been prepared for the use of the practical man who is concerned with the utilization of sheet steel and tin plate. The author has done very well in clearly expressing the essential facts in everyday language and has not made the mistake of attempting to write what is generally termed, "a high-brow book." Although the book is not a large volume, the author has begun at the beginning and explained in an understandable way the underlying principles of iron and steel making, as they relate to the various forms of sheet steel and tin plate. He has explained the operations and materials involved in the rolling and treating of these products and gives a very thorough description of the nature and purpose of the numerous grades and finishes in which steel plate are produced.

The book is divided into two parts, with a total of 16 chapters and 7 appendices. Railroad mechanical department officers, especially those who are intimately concerned with the utilization of sheet metal in car and locomotive repair work, will find this book a useful addition to their reference library.

THE READER'S PAGE

An Answer to the Question on Rule 17

To the Editor:

Referring to the question in the February issue of the *Railway Mechanical Engineer,* page 84, dealing with A.R.A. Rule 17, the rule in part reads: "Defective non-A.R.A. standards may be replaced with A.R.A. standards (which must comply with A.R.A. specifications) etc." The 5-in. by 5-in. coupler shank with 9⅛-in. butt and Type D head referred to in the question does not meet these requirements.

Also, since A's car is equipped with "coupler shank, 5-in. by 5-in., with an 8½-in. butt" and is so stenciled, the application by B of a 5-in. by 5-in. coupler shank with a 9⅛-in. butt and Type D head would be wrong repairs, according to Rule 16 which reads: "Repairs to foreign cars shall conform in detail to the original construction."

J. E.

Mutual-Admiration Clubs Are of No Help to Business

To the Editor:

Allow me to make a few comments on your correspondent's letter in the February, 1931, issue under the heading "Who Belongs to This Organization."

If I knew of such an organization as the one described on the railroad with which I am connected and if I were a master mechanic, I would set about at once to bring about a complete reform to knock the conceit out of those men.

It has often been said that a little knowledge is a dangerous thing for some people and that self praise gives off a bad odor. These men of which "Master Mechanic" writes seem to have the wrong attitude toward their jobs, their duties and responsibilities toward the railroad. Perhaps they are laboring under the illusion that the railroad is being operated solely to give them soft jobs and, as the jobs are not as soft as they would like to see them, they play sore head.

Their minds must be warped and their ideas distorted due to lack of proper knowledge of their relationships to their employer. If these men should go into business on their own hook for a year or two (if they could stay in business that long), they would quickly discover the fact that they have a great deal to learn in order to succeed. They would have to take all the risk, with nobody to blame but themselves if failure should overtake them.

If I were "Master Mechanic," I would work towards arranging the subject to be discussed at club meetings. I would expect each man to pledge himself whole-heartedly to support such a program as that which was published on page 80 of the February issue entitled "A Fight for Your Job." But here it may be inferred, "How can I help the railroad to carry out that program?"

You can help a great deal. You are a legal voter, a tax payer and a citizen of this great United States. As such, you have rights, privileges and duties. Exercise them for your own good and that of your railroad as well. Instead of discussing how clever you are and how poorly managed your railroad is, how about writing to your senator, your congressman or the members of your state legislature opposing certain measures or pending legislation designed to further curtail railroad earnings, or writing relative to the unfair competition to which the railroads are subject or excessive taxation of yourself as well as the railroads. They are glad to get the opinions of the people back home, and such letters, if briefly written and to the point, will not fail to exert considerable influence in shaping the course of the government toward the railroads.

Leave the criticizing of the railroads to Arthur Brisbane. Mind your own business, which should consist of constructive suggestions given freely to your superior and at meetings of your foreman's club.

Nobody can stand still in these days of rapid progress. Those that do not move forward fall backward and eventually become deadwood to the railroad that employs them.

An organization such as "Master Mechanic" mentions has long since ceased to justify its existence and should, therefore, be entirely reformed or abolished.

L. I. Berty.

A Tribute to William Mason

Maracaibo, Venezuela, S. A.

To the Editor:

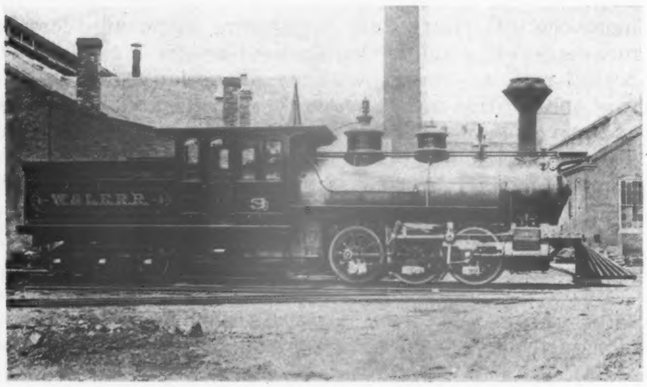
The recent death, at Taunton, Mass., of the daughter of William Mason brings to the minds of the older generation of railroad men the work of this brilliant pioneer locomotive builder. It is probable that no one man did more to bring the locomotive to its present state of near perfection than did this practical, resourceful, ingenious mechanic of a former day.

Entering the field in 1852, after several years of successful building of cotton machinery, Mason so impressed his individuality upon the industry as to bring undying fame to himself and the beautiful creations turned out of his shops. A born artist, his work had a beauty of line and proportion which was the despair of other builders of his day, and with the excellent finish and workmanship that characterized all of his productions he made a mark for others to aim at for many years.

Mason's earnest advocacy of the Fairlie, or, as he termed it, the "Bogie" type of locomotive and the Walschaert valve gear, made him looked upon as something of a crank by the early mechanical societies, but recent years have proved that he was ahead of his time. However, the cool reception given his ideas did not prevent him from building many of these "Bogies" and giving much thought to the improvement of the Walschaert gear.

The locomotive shown was built shortly before Mason's death in 1883, and it is doubtful if the performance—for its size and weight—of this locomotive and others of this type has ever been equalled, before or since. In Mason's first applications of the Walschaert gear he tried to get the radius-rod hanger as long as possible, putting the tumbling shaft on top of the boiler.

In the locomotive shown he went to the opposite extreme and made it very short, but the results obtained proved the soundness of the change. There was an exceptional slip of the block at the end of each stroke which tended to keep the steam and exhaust ports open a fraction longer at the right time and probably produced the unusual results attained.



One of the last of William Mason's designs—an 0-6-0 type with Walschaert valve gear built in 1883

The writer both fired and ran these locomotives in his early experience and often had the fireman unlatch the fire door while on a hill so as to better hear the beautiful, snappy, clear-cut exhaust of these masterly creations. Combined with the distinctive, resonant ring peculiar to the diamond stack, it made an impression never to be forgotten by one with any affection for a real locomotive.

F. M. WESCOTT.

Rule 4 of the 1931 Rules of Interchange

NEW HAVEN, CONN.

TO THE EDITOR:

I would like to get the opinion of some of the readers of the *Railway Mechanical Engineer* in regard to the following A.R.A. interchange rule.

Rule 4, Sec. J, states in part "Joint inspection, within 90 days after first receipt of car home, may be made by representative of car owner and a representative of a disinterested railroad, or by a chief interchange inspector."

If this rule is to be applied as written, it will work a hardship in some cases, if a car is interchanged with the owner at a point where the latter has no inspector and the car travels 50 or 100 miles before an inspection is made and it happens to be located about the same distance from a foreign connection. Under such conditions it would be impracticable to have a distinterested inspector make an inspection where the car owner found that a car had additional concealed defects.

I should think under such conditions if damaged parts were concealed and directly associated with those damaged parts covered by a defect card, the inspection certificate would be valid, although it bore only the signature of the car owner's representative.

I really think the above to be in accord with the spirit of the rule as outlined in the preface to the code of interchange rules. It is my contention that this rule should be interpreted to have the same principle as Rule 12, second paragraph.

JAMES W. MCDONNELL.

What Is Standard Side-Bearing Clearance?

TO THE EDITOR:

If one desires information on side-bearing clearance, he has to turn to Rule 4 of the A.R.A. Loading Rules since no mention is made of this subject in the A.R.A. rules governing the interchange of cars. The writer has read this rule several times and does not quite understand its meaning.

Apparently others are confronted with this problem since many mechanical officers differ as to what should be adopted as a standard or proper side-bearing clearance. They issue their instructions to cover their individual roads and these instructions are passed down to the men in the shops and to the inspectors who usually are anxious to comply with them. However, when a foreign car comes under their jurisdiction, they observe the side-bearing clearance and, if it is near the requirements, they feel that it is satisfactory to continue the car in service. If this car encounters a derailment the inspector, who failed to hold the car until the road's side-bearing clearance standards were complied with, is held responsible.

The question is: What is the proper side-bearing clearance in accordance with this one rule we have? The writer has a definite idea of what he thinks it should be: A maximum clearance of $\frac{5}{16}$ in. or a minimum clearance of $\frac{1}{8}$ in. on each truck. This should be divided equally between the two bearings or, with one bearing flush, the other bearing should have the full $\frac{5}{16}$-in. or $\frac{1}{8}$-in. clearance.

GENERAL CAR FOREMAN.

Should the Car Owner be Responsible?

TO THE EDITOR:

An interesting repair was recently called to my attention. A foreign box car was derailed resulting in damage to a hand-brake gear box which was attached to the end sill of the car in question. The parts damaged consisted only of safety appliances, including the brake staff, gear wheels and gear box. A.R.A. Rule 33 would therefore apply and make the car owner responsible for the damage to the car. However, the man making repairs to the car had to decide whether or not a defect card was in order. In view of issuing the defect card, he wondered whether or not the car owner should be billed or should the record be marked, "no bill." He took the latter alternative and marked the repair record, "no bill" and applied a defect card for the wrong repairs made; which was necessary, not having this type of hand-brake gear box in stock.

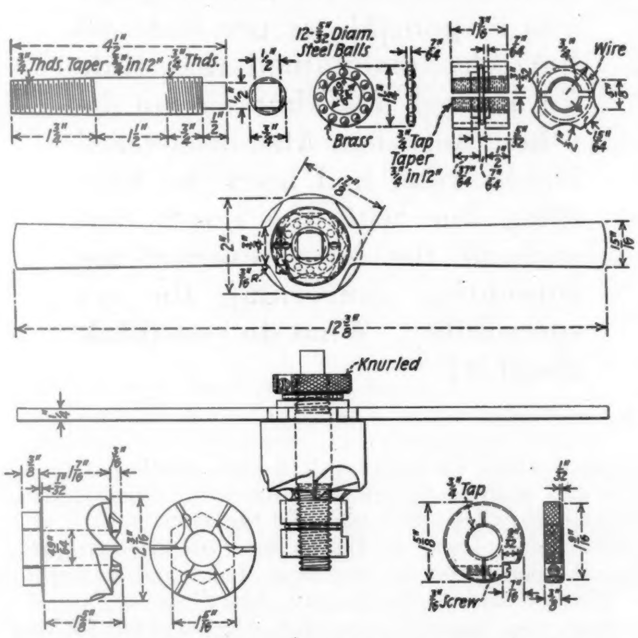
Later, the writer learned that this repair should not have been marked "no bill" but the repairing line should have rendered a bill against the car owner for all the repairs made and attached the defect card for the improper repairs, and that when the car owner corrects the improper repairs he will be reimbursed. In addition to this being a technical question as to the proper procedure of billing, it hardly seems fair that the car owner should stand any of the expense involved in the repair or restoring this hand brake arrangement to its original condition. This statement is made in view of the fact that the car was derailed and, because there was no part of the car other than safety appliances damaged, the car owner is held responsible.

GENERAL CAR FOREMAN.

With the
Car Foremen and Inspectors

Reamer for Car Triple-Valve Seats

SINCE it is of the highest importance that the emergency-valve seat in the check case of a triple valve be as near perfect as possible to eliminate possible air leakage from the train line into the valve, the equipment used for repairing the seat should be given careful



A reamer designed to reseat emergency valve seats without chattering or sticking

consideration. The design of a reamer for repairing this important valve seat is shown in the drawing.

It consists of a six-fluted cutter mounted on a central shaft together with a knurled clamping nut, a handle and two leaders, the latter being separated by a ball-bearing race. The cutter is 2⅛ in. in diameter and has an overall length of 1⅝ in. The leaders, which rotate in the bushing below the valve seat while the reamer is cutting, serves to steady the reamer and to assure a perfect seat. The leaders are separated by a ball-bearing race which is made up of a brass race and twelve 5/32-in. steel balls. The leaders are of circular cross-section with four concave faces, cut with a ½-in. radius until the faces are ⅝-in. long.

A ¼-in. round handle, 12⅜ in. long is used to actuate the reamer. It is set next to the body of the cutter and is held in position by the knurled nut. When assembling the reamer, the leaders with the ball-bearing race between them are screwed on the central shaft after which the cutter and handle are mounted. A ball-bearing race is also set between the handle and the knurled clamping nut. After the nut is screwed down on the shaft until the parts are all securely mounted the knurled nut is clamped to prevent movement of any of the parts. When in use the ball-bearing races between the leaders and between the knurled nut and handle of the reamer, prevent sticking or chattering while the cut is being taken from the valve seat.

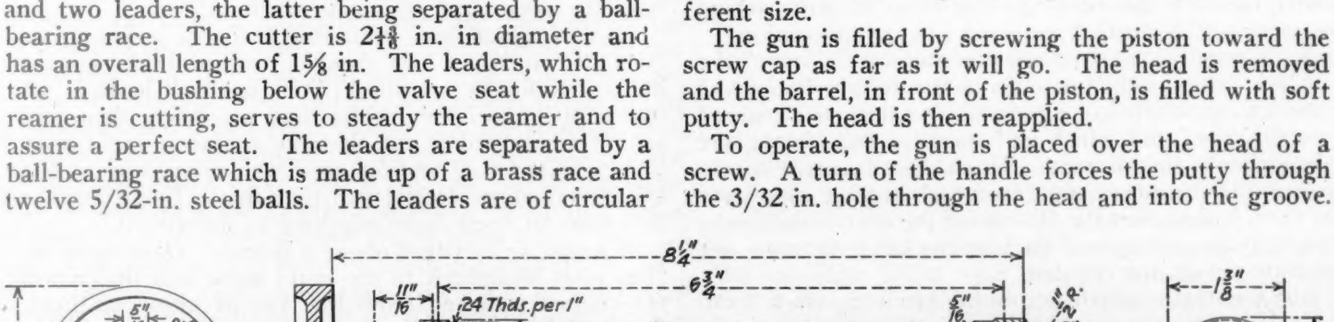
Putty Gun for Round-Head Screws

A NUMBER of roads which own or operate coaches of wood body construction in trains with all-steel equipment have found it advisable to cover the wood cars with steel plate, not only to give added strength to the superstructure but to have all the cars in a train of similar appearance. The application of the steel plate to the wood frame members requires a large number of round-head screws. This style of screw is used to give the appearance of rivets.

Filling the grooves in the heads of round-head screws with putty is a tedious task when done with a putty knife. The putty gun shown in the drawing is designed to expedite such work. It consists of a barrel made of 1⅛-in. brass tubing. The screwcap, handle and head fittings are of stick brass. The screw piston and piston head are of mild steel. Any number of heads can be used with this gun as required for screws of different size.

The gun is filled by screwing the piston toward the screw cap as far as it will go. The head is removed and the barrel, in front of the piston, is filled with soft putty. The head is then reapplied.

To operate, the gun is placed over the head of a screw. A turn of the handle forces the putty through the 3/32 in. hole through the head and into the groove.



Putty gun for filling the grooves in the heads cf round-head screws

Alec and Dave Return

By T. J. Lewis

Alec billed Dave's road for a pair of wheels with sharp flanges, believing that was the only defect, but Dave discovered the wheels had been slid flat. Dave secured joint evidence to support his contention that the handling line was responsible as per Rule 68 but Alec maintained that Rule 74 applied. The shoe was on the other foot when Alec discovered Dave's road had been the handling line with the result that each of the boys reversed his contention concerning the responsibility. What do you think about it?

IN addition to their interchange work, Alec and Dave each have a small repair-track force to supervise, just sufficient to keep up running repairs of the interchange and a light train-yard service. They do the inspecting on the first shift and have one inspector each on the second and third shifts. They check repairs and make out their billing repair cards, also defect cards when it just must be done.

The other morning as Alec was passing the rip track on his way to the interchange, he saw the repairmen arranging to jack up a car of Dave's road. Looking at the shop card on the car, he read, "worn flange, L 1". The card was signed by his second-shift inspector. Being right at the wheel, he took a look at it, put his wheel gage on the flange and found that it was "out", so he stepped over to the wheel storage track, checked and marked the wheel to be applied, pointed it out to the repairmen and went on his way, intending to check the removed wheels and axle as he returned, after it was out from under the car.

The weather had been threatening all morning and as Alec left the interchange it began to rain and by the time he reached the rip track it was coming down lively. Stooping over his record book to protect it from the weather as much as possible, he hurriedly copied the wheel numbers and dates of casting and other markings, took the axle and journal dimensions and made a dash for his office or shack, either one or both.

As Alec passed the shed where the material bins are located the repairmen were utilizing the time while it was raining to brush out the bins, sort and replace materials in their proper places, re-thread pipe nipples, gouge broken ends of pipe out of anglecocks, re-tap the anglecock threads, replace broken anglecock handles and do all manner of rainy-day jobs. He thought it would be a good time to write up his records, make out his billing repair cards and get all his office work caught up. Incidentally, among other things he did was to make out the repair bill and wheel report for the pair of wheels applied that morning to the car from Dave's road. By the time he had finished, the rain had stopped and it was nearly time for the passenger train, so he gathered up his reports to be mailed and went over to the station.

As he was leaving the passenger station, "Skippy," the call boy, came after him to go to the freight house and inspect a car which had a commodity ticket on it marked "merchandise" and which had shown a leak during the rain earlier in the morning. From there he made another round to the interchange, then took another slant over the yard, looked over the fill-out for the next Northbound freight train and arrived back at the office to make out the time tickets for the day.

Just then Dave strode across by Alec's rip track from the opposite direction and noticing a home car on it, he walked up to it and saw that a pair of new wheels had been applied. The condemned wheels still stood on the track in front of the car. The one nearest him looked like a good wheel, so he gave it a slight push and as it rolled he felt a slight vibration and heard a dull thump. Turning it on over, up came a slid-flat spot that just took his wheel gage to a hair." "Umph," grunted Dave, and mumbled "so Alec is making us a present of a pair; I know it nearly took the old boy's hide." Going over to the mate wheel, he found only a very small spot on it. "It's still strange to me," he thought, almost aloud, "never both wheels in a pair slid the same."

Alec's office being on Dave's route to his own yard, Dave stopped by to pass the time of day and leaning in the window said, "whatcha say, Alec?"

"Save your money," mumbled Alec, without looking around, then, finishing his work, he turned round and asked, "Which way, Dave?"

"Back to the works," replied Dave. "Just answered a call over to the ice plant to advise with the fellows over there about the bracing of a boiler they're loading for shipment up the road." Then: "Alec, have you ever found out why it is that the two wheels of a pair never have the same sized slid spots on them?"

"No. I never have been able to figure it out," said Alec. "Sometimes I've thought that the brake rigging had something to do with it; then, again, I decided that maybe one wheel was harder than the other; then, still again, it occurred to me that the engineer might have been working sand and one pipe was stopped up or one side flowed more freely than the other. But it may be that none of these have anything to do with it."

"I know we've talked about it before," Dave went on, "but what brought it to my mind anew was that wheel you've just removed from that car of ours out there. One slid to the gage limit and the spot on the other is not much bigger than a quarter."

Alec's interest quickened perceptibly and he said: "What are you trying to talk about Dave?" "We haven't removed any slid wheel from any of your cars. You must have been looking at the wrong wheel."

"I was looking at a slid flat wheel," Dave persisted, "and I figured it came out of our car. The wheel is standing on the track right in front of the car and both the wheels have our road's initials cast on them."

"Yes, but that is a thin flange, Dave," said Alec, "I gaged it myself and have already made out the billing repair card and its gone in. Here is my copy of the wheel report," and Alec reached the wheel report toward Dave who paid no attention to it, but said: "Well, you're wrong this time Alec, sure, because that east wheel is slid."

"No, I guess not. No man is ever wrong in removing a wheel with a flange worn as thin as that one on the west," said Alec, "and as for the other wheel being slid flat, what you say is the first I've heard of it. Anyway, the work is done and the bill and report gone in."

Dave's bristles began to rise and he grumbled "Now look here Alec, you're not going to start any such funny business as that, I know, because if you do you won't get anywhere with it, I'm telling you now."

"What do you mean 'funny business'," asked Alec, "nothing funny about it that I can see." The fact was that what Dave had said about the slid wheel had begun to soak in on Alec's mind and he was beginning to wonder to himself if he had really 'gummed the works.' Anyway, he had done an honest job and Dave need not think that his threats of him 'not getting anywhere with it' was going to affect matters in the least; he could run his own job without any of Dave's help and it was a good time to let Dave know it, so he said:

"Just save your threats Dave. I'm not trying to get anywhere with anything that I'm not already gone with, for that job is finished and I'm thru with it; but, just for your satisfaction, I'll show you what that wheel was removed for—"

"Yes," Dave cut in, "and I'll just show you what it should have been removed for—"

They had started voluntarily at the same time for the car and Alec broke into Dave's argument with:

"I'm not expecting, nor trying to satisfy everybody about this matter, Dave. I found out long ago that its impossible to satisfy everybody about any one thing and if I do things to suit myself and the company I work for I think I'll be doing very well without getting you to come over and run my job for me."

Alec's obstinacy and ill humor had not improved Dave's state of mind any and he came back with:

"Look here, Alec, I'm not trying nor wanting to run your job. I just thought you had made an honest mistake and I wanted to help you get right on it before it went any further."

"No, you didn't," Alec broke in testily, "you started in to make me get right, according to your own notion of what was right in this particular case, but here is the wheel to show for itself." They had arrived at the car by this time and Alec continued, "this wheel was removed and billed for according to the first paragraph of Rule 74 and it is a plain enough case for anybody. See, here is Joe's chalk-mark on the plate, just opposite the thin part of the flange. Now you can gage it for yourself, with your own gage, and you'll find it thin for a distance of at least eighteen inches right here."

The moment Alec stopped, Dave got started:

"That's all right Alec, that's perfectly all right, but what I'd like to know is, how it happened that neither you nor Joe heard this other wheel bumping. You could surely hear it further than you could see that worn flange."

"I've never seen the car 'til this morning," said Alec, "and when I came to work it was standing right where it is now, with this worn part of the flange turned right to me. Joe shopped it and, of course, I don't know whether he was near it any time while it was rolling or not; if he was, it seems he would have heard it if it was slid flat."

"Well, just turn it over and look right over here at this other wheel," said Dave, as he rolled the wheel until the slid spot came up. "Sure, that wheel's worn out, but what seems funny to me is the fact that you took the wheels out, checked 'em on your record, made your bill and sent it off and never did discover that you had ruined this one by sliding before you ever found that that one was worn out. Looks funny to me—sure does."

This half insinuation of Dave's that Alec must have known of the slid wheel made Alec furious. He tried to speak but couldn't, so he turned away as if to leave, swallowed hard a couple of times and came back and, looking straight at Dave, said: "That's enough of that brand of stuff, Dave,—plenty, and I don't want to hear another word of it. You're trying to make it appear that you think that I want to chisel you out of a wheel, but you know better. Ordinarily, of course, I would have turned the wheels over and inspected them both carefully when I checked them, but it was raining cats and dogs at the time, and it took all I could do to keep the rain from ruining my record book and not giving a thought to a slid wheel, I glanced at that one and gave you credit for it being a good second hand. Just as I told you to begin with, its a Rule 74 job and that's the way its going to stand so far as I'm concerned.

Dave knew he had gored Alec pretty deep and felt a little sorry for it, because he knew Alec was honest, as well as obstinate. However, Dave was not satisfied and so he followed up with: "Yes, but Alec, how about that interpretation under Rule 68, page 92?"

"I don't care a snap about that." Alec growled and continued, "and while you are in that line of business, there are some more scrap wheels over there,—if you will snoop around among them maybe you'll find something more of interest to you."

This shot of Alec's registered, as he knew it would, and Dave flared up and came back, "Look here Alec, don't you accuse me of snooping, not a time. It was just by accident that I came by here and caught this job of yours, and to offset that bill of yours, you can just give me a good defect card, 'properly filled in on both sides with ink or black indelible pencil' ". Dave maliciously quoted the last phrase of the rule.

"That would be bright in me, wouldn't it?" said Alec, "giving you a defect card in rebuttal of my own bill. Nothing doing, that's all."

"All right then Alec" said Dave testily, "we've generally been able to settle our differences between ourselves, and I'd rather do it that way, but since you choose to be so hard-boiled, I'll tell you what I'm going to do. I'm going to get Ed Hunt of the G.Y.M. to come over here and sign joint evidence with me on this slid wheel and I guess that will block your bill."

"I don't give a dang what you do", Alec retorted, as he turned and walked away.

Dave went straightway and got Ed Hunt to come over and sign joint evidence with him and mailed it in to the G.F.C.R. at North Yard Shop that evening.

Alec called the second trick inspector up to ask where the car came from. Joe sleepily said he didn't know, that it was standing first out on track number one when he passed that way going to the passenger station to meet No. 26 and the worn flange attracted his attention, he gaged the wheel and applied his bad order ticket and hurried on to the station. Then, later on, while he was down in the other end of the yard, the switchmen had placed the car on the rip track—he noticed it there when he came in at knocking-off time. That was all he knew about it.

Alec had a bad night. He dreamed about slid flat wheels and in his dreams that particular wheel had such

a big flat spot on it that when he rolled it over the flat surface struck the rail and he was unable to budge it again, and it seemed to him that he had spent the remainder of the night tugging at it.

Alec started to work early next morning, because he wanted to go by the yard office and trace the movements of that car and find out where it came from. As he crossed he tracks he met the switch foreman who handled the car and the foreman cleared the whole matter up, voluntarily, as follows:

"Alec, you had a Q.I.C. car on the rip yesterday that I intended to tell you about. Day before yesterday, as I started in from switching the coal yards, the Q.I.C. switch crew came out on the lead ahead of me, they had only this one car for us and Jim asked me if I'd bring it on in and save him the trip down to the interchange, as he had been switching down in Mill Town all morning and was having to run for water. I told him I would, so he dropped it on the lead in front of me—and I kicked it down in number one track with the other northbound stuff. Before I got a chance to see you Skippy came after me with a bunch of green orders and it slipped my mind completely."

"Well, say!" said Alec, stopping short, "it's not possible that you slid a wheel on that car, is it?"

"Sure not," was the answer, "I only moved it a distance of two or three blocks."

Alec hurried by the yard office to verify the movement, then over to see Dave before he went to work. Dave was just starting out and met Alec.

"Hello, Dave", said Alec, "I've just learned that our folks didn't slide that wheel after all."

"Well, somebody slid it," said Dave, "and you took it out."

"Yes", Alec went on, "I supposed it had come in on our road but, instead, the switchmen interchanged it there at the south end of the yard and had only handled it a few car lengths before they put it in the rip track. They got it from your folks through the cross-over."

"Huh!" ejaculated Dave. For a moment he stared at Alec with stubborn incredulity, then, seeming not to have grasped the full meaning of Alec's statement, he added, "Well, what's that got to do with it, anyhow?"

"Just this" said Alec, "I want a good defect card for one pair of slid flat wheels, 'properly filled in on both sides with ink or black, indelible pencil' ", handing back Dave's jibe of the previous afternoon, in quoting the last phrase of the rule.

"Oh! That's it, is it?" Then Dave continued, slowly, "Well, nobody can blame you for wanting. Your mind has, of course, changed since the boot got on the other foot, but the first paragraph of Rule 74 is just the same as it was yesterday, and that's what the job was done under, you know."

"Then, you refuse to card it, do you?" Alec asked.

"Sure I do. Since it was too late for you to give me a card yesterday, its 'way too late for me to give one today, 'Sauce for the goose, sauce for the gander', you know." Dave said this with a degree of finality that convinced Alec that further discussion would be futile, so he said, as he turned to leave:

"Well, Dave, I'm glad you sent that joint evidence in. Maybe it will help some."

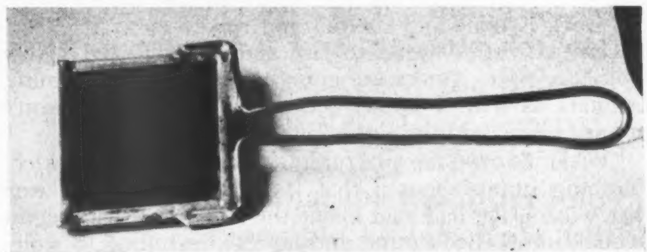
"You go to the devil" Dave snapped over his shoulder as he walked off in the opposite direction.

Alec and Dave are as chummy as ever now, but how in the 'rule book' did this jumble ever get straightened out?

* * *

A Mirror for Car Inspectors

THE general car foreman of an eastern railroad shop designed and made the small hand mirror shown in the illustration for the use of car inspectors, to enable them to inspect parts of car trucks which normally would not be seen. The mirror is enclosed in a light 3-in. by $3\frac{1}{4}$-in. metal frame and is fitted with



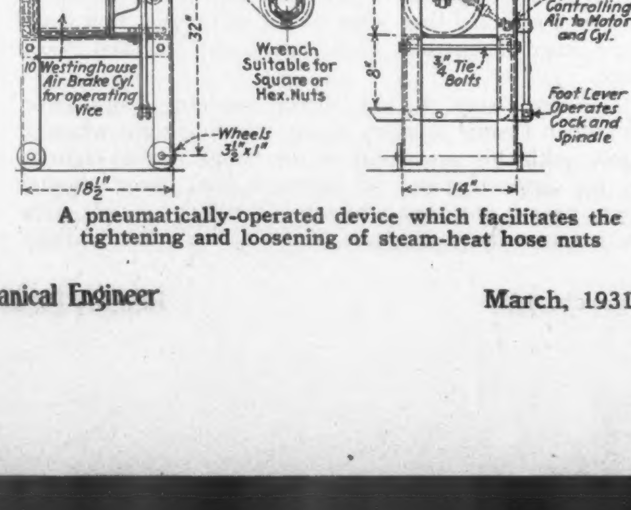
A 3-in. by $3\frac{1}{4}$-in. hand mirror with a 7-in. pliable handle for car inspectors' use to locate defects normally not seen from the ground

a $\frac{1}{8}$-in. copper-wire handle, 7 in. long. The flanges of the case and the pliable copper handle are soldered together to form one integral piece.

During the past year, with the aid of the mirror, one car inspector alone found 24 cracked arch bars which otherwise would not have been discovered without taking down the trucks. In addition, this inspector inspected all the cars in his assigned territory and made a nominal number of yard repairs besides completing other odd jobs.

Removing and Tightening Nuts on Steam Hose

BECAUSE of the pressure to which steam-heat hose is subjected it is desirable to have the nut on the clamp as tight as possible. When this nut has been drawn up tightly and the hose has been in service for a considerable period of time it is often difficult to remove it. With this in mind, the device shown in the drawing was built to facilitate the application and removal of the nut.



A pneumatically-operated device which facilitates the tightening and loosening of steam-heat hose nuts

It consists of pneumatic device for hold the head of the bolt, a wrench which is actuated by a train of gears operated by a No. 3 air motor, and a suitable stand for mounting the various units. This stand is 32 in. high, 14 in. wide and 18½ in. long and is mounted on wheels, 3½ in. in diameter. The frame of the stand is constructed of 2¼-in. by 2¼-in. by ¼-in. angle iron.

The air cylinder for operating the vise which clamps the head of the bolt is mounted beneath the table of the stand and held in position by a bracket supported by ¾-in. tie bolts. The air motor for operating the wrench is also mounted beneath the table. The spindle of the motor is extended above the table to the gears which actuate the wrench.

The wrench is so designed that it can be used on either square or hexagon nuts. It is connected to a foot-lever arrangement which moves it up and down, the shaft to which the wrench is bolted being designed so that it can slide in the gear which actuates it. The foot lever also operates the air valve which controls the motor.

When in use, the head of the bolt is placed in the pneumatic vise and the foot lever is lowered. As it moves downward, it pushes up the long lever at the back of the stand, opening the air valve and starting the motor. The upward movement of this lever moves the now rotating wrench downward on the nut, tightening it. The air motor can be reversed by hand when it is necessary to use the device for loosening the nuts.

Decisions of Arbitration Cases

(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Defect Card Claimed Improperly Issued

On June 3, 1928, Marion steam shovel No. 3517, traveling on its own wheels with boom loaded in Erie car 8703, was delivered along with eleven other cars by the New York, Chicago & St. Louis to the Terminal Railroad Association of St. Louis. Inspection was made at the receiving connection by T. R. R. A. of St. L. inspectors and the coupler-casting carry bolts on the A end of the car were found to be in a bad order.

The car was moved to the T. R. R. A. of St. L. repair track and a claim was made against the N. Y. C. & St. L. through the chief interchange inspector for the following additional defects: one metal end sill bent; one end-sill angle bent; two metal draft-sill flanges bent; one end-sill brace bent; one coupler casting bent and broken; one ash-pit bottom sheet bent; two ash-pit side sheets bent; two ash-pit angles bent.

On June 7, 1928, the chief interchange inspector issued a defect card in favor of the T. R. R. A. of St. L. and against the N. Y. C. & St. L. for the above defects. Repairs were made by the former road and a bill rendered against the Nickel Plate.

At the time of the original inspection on June 3, the delivering line's general forman notified the T. R. R. A. of St. L. foreman that he would look up the interchange records on the car and if the Nickel Plate was responsible that the chief interchange inspector would issue defect cards against the Nickel Plate covering the damage. On June 7, the chief interchange inspector asked the Nickel Plate foreman what he was going to do about the steam shovel as the T. R. R. A. of St. L. wanted to know what disposition to make of it and stated that, if the Nickel Plate did not give the Terminal railroad a defect card, that road was going to send the shovel back.

The Nickel Plate foreman informed the chief interchange inspector that the inspection record did not cover all the defects found when the car was moved to the repair track. The chief interchange inspector stated that in his opinion all the damage had been done at the same time. In order to get the shovel repaired and moving without further delay, the Nickel Plate foreman advised the chief interchange inspector that if he thought that the N. Y. C. & St. L. was responsible that he could give the T. R. R. A. of St. L. a defect card and have them do the work. A defect card was issued, the repairs made and a bill rendered, which was paid.

Ten months later the Nickel Plate submitted the case to the Superintendents' Association of the St. Louis-East St. Louis Terminal District, contending that, if either the coupler casting or casting bolts were defective at the time the equipment was delivered to the T. R. R. A. of St. L., the defects should be considered as owner's defects and that the additional damage occurred when the T. R. R. A. of St. L. handled the shovel a distance of two and one-half miles to its repair tracks. It also contended that the chief interchange inspector should have handled the case on the basis of the interchange the record—inasmuch as he disregarded A. R. A. Rules 2 and 4, in that defect cards are not issued at the time cars are interchanged—and that he should not have requested the Nickel Plate foreman to give his authority to issue a defect card against the N. Y. C. & St. L. to prevent further delay and daamge to the equipment.

The T. R. R. A of St. L. stated that, owing to the damaged draft rigging at the north end of the steam shovel at the time of the delivery by the Nickel Plate, the shovel broke off from the next car north in the cut being switched over the hump and run south down the hump. There was no damage done to the south end of the shovel and a subsequent examination showed that the train had parted because of the bad order condition of the coupler casting.

The T. R. R. A. of St. L. contended that the Nickel Plate was responsible for the damage to the steam shovel, pointing out the fact that the case had been submitted to the Superintendents' Association of the St. Louis-East St. Louis Terminal District and that the issuance of the defect card against the Nickel Plate was sustained by that organization.

The decision as rendered by the Arbitration committee follows: "The contention of the Terminal Railroad Association of St. Louis is sustained on the basis of the next to the last paragraph of Rule 4."—*Case No. 1655—Terminal Railroad Association of St. Louis vs. New York Central & St. Louis.*

FIFTY YEARS AGO.—The locomotives recently built for the use of the Bound Brook line of the Reading are the heaviest ever built in this country for fast pasenger service. These are of the American type and have a total weight of 96,200 lb. with a weight per driving wheel of more than 16,000 lb. The locomotives are equipped with the Wooten type boiler for burning anthracite coal.—Railroad Gazette, January 14, 1881.

Dirty and Inoperative—Why?

By An Old-Time Air Jammer

This article was contributed by a general air-brake foreman who has signed himself "An Old-Time Air Jammer." He objects to the frequent use of the phrase "dirty and inoperative" on car-repair bills. There are phrases of similar nature, for instance "waste grab," that do not mean much and are of no assistance in really correcting defects. Further discussion, designed to abolish the use of such phrases, is invited

"DIRTY and Inoperative." What a multitude of sins those three words cover!

When we consider the advancement and improvements made in the air brake in the past 15 years, why do some continue to use that old phrase, "Dirty and inoperative?" Have the rip-track inspectors and write-up men, who write and check the bills for cars while on the repair tracks, fallen by the wayside?

When we have a car on the repair tracks, where we find that the brakes are not working properly regardless of the cause, why do they still persist in using these three words, "dirty and inoperative?" When we have a car where it is necessary to clean the brake before the 60-day limit or even the nine-month limit has expired are there no other defects found but "dirty and inoperative?"

To illustrate, we have a foreign car on our repair tracks where we find the brake is subject to cleaning. We clean the cylinder, change the triple valve, clean the dirt collector and retaining valve, test the brake-cylinder leakage with a gage screwed in the triple valve, keep the leakage down to 5 lb. per min. or less, test the retaining valve, charge the brake and test it with the single-car testing device, soap-suds all connections, tighten all connections, and know that the brake is OK in every respect.

This car will run perhaps 30 or 40 days, will be knocked around by switch engines and in trains, and perhaps be put in on some rip track for coupler or other defects. The air men come along and test the brake and condemn it on the slow-application or release test. They will notify the inspector or write-up man that the brake will not pass the test on account of not applying.

Then what happens? The bill is made for C. O. T. & S. as per Rule 60, and then is sent to the car owner who sees that the 60-day limit has not expired. He sends the bill on to the road which cleaned the brake shortly before, asking that road to cancel it.

The bill will be received by the accounting department which will send it to the superintendent of motive power and he in turn sends it to the master car builder, who turns it over to the general car foreman, and from him on to the air-brake foreman with a note pinned on it "Why?", and the first thing that is noticed is "dirty and inoperative."

Several years ago a certain road put a series of cars through the shops where steel ends were applied and the cars rebuilt. All the cylinders and reservoirs were taken down and new packing cups and cylinder gaskets applied. These cars were equipped with H1 triple valves, which were removed and new K2 triples were put on after being put over the 3-T test track. New pipe was applied to all the cars and, when completed, they were tested by an experienced man with the new single-car testing device.

This work was watched by two car foremen and the general car foreman, and was checked by the air-brake foreman. Shortly after the cars were put in service three bills were received from foreign roads, and in each and every case the bill showed in the "why made" column "dirty and inoperative."

Are all the defects "dirty and inoperative?"

Doesn't anything ever happen to a brake?

Doesn't the brake ever leak off?

Doesn't the triple ever blow the retaining valve?

Doesn't the brake ever go into emergency when making the service-stability test?

Doesn't the brake ever fail to release in position No. 2 on the testing device?

All these defects go to make up a bill. Why not, when making out the repair bill at the car, state the true cause and not that old worn-out excuse, "dirty and inoperative."

The A. R. A., the Air Brake Association, the manufacturers' experts, the air-brake supervisors, the air-brake foremen and the rank and file in general, all are working and doing their best to put the air brakes in 100 per cent condition. The days of piecework and the old-time method sometimes used of cleaning the brake with a stencil brush are things of the past.

With the coming of the 3-T test rack we reduced the packing-ring leakage from 5 lb. in 30 sec. to 5 lb. in 1 min., and some are holding it below that.

The leakage indicator came along and showed us that our slide and graduating valves were not as good as we thought they were. The friction indicator helped a lot too. The composition-packing cup and rubber cylinder gaskets were a blessing. The use of gages showed us where the parts were below the limits. The step-cut ring, in four sizes, with the gages available to measure the bushing for a proper packing ring, were a godsend. Improved bushing grinders make the bushing true for this ring. The diaphragm cock on the test racks did away with the old key cock—one could never tell when it was leaking. The improved single-car testing device was given to us, it has done its duty and has well paid for itself.

Train-line leakage has been brought down to nothing. No more do you hear a compressor groaning on account of the strain put on it to keep up the pressure caused by leaks in the train line. We are gradually getting away from steel pipe and are using wrought iron. We are gaging the cylinders on every car that comes on the rip track to see that the brake complies with the A. R. A. rules. We are applying the brake through a .035-in. orifice to

ascertain how the brake will work on the rear end of a 100-car train. We release the brake through a .0225-in. orifice to determine how it will release. The men in the air room have been educated to know that a triple valve is something besides a chunk of iron with a lot of dodads in it. Our test-rack men know what is required of them and are not letting anything slip by.

Our air-brake supervisors are checking the work on all tracks and the A. R. A. checkers are on the job too. The I. C. C. is checking up on all of us—and try to slip anything over on them and get by with it! Look at the air-brake that we have today and compare it with what we had 40 years ago.

Think of the time, study and money it has taken to put this where it is today and then stop and think that we are still getting bills sent back to us with the notation "dirty and inoperative" when it was really a cylinder gasket that was blown out.

Come on, you rip-track men who write these bills; let us know what is really wrong. If a brake is inoperative, ask what the trouble is.

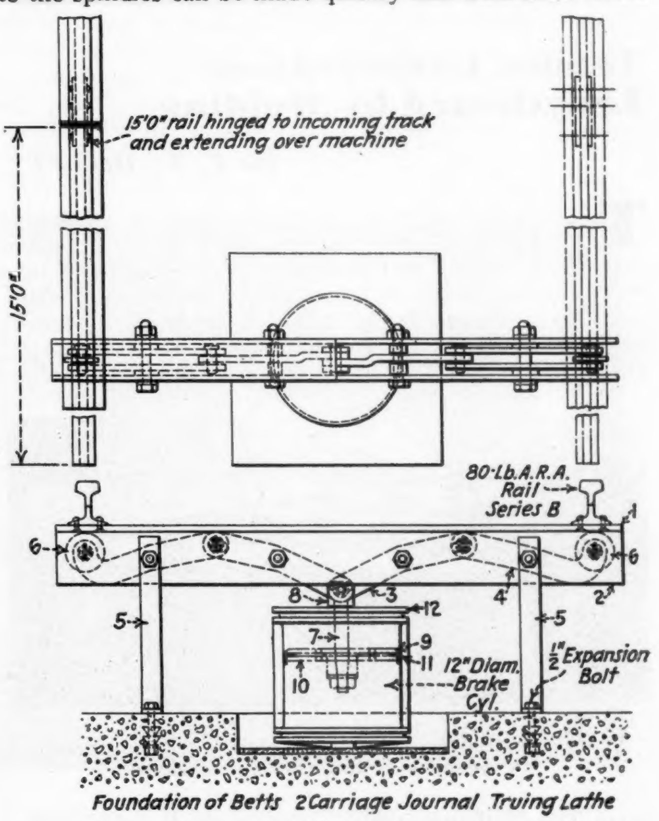
We know that curiosity killed the cat, but no one ever got killed for asking questions. If the air man condemns a brake, find out what is wrong. He will tell you and then on your bill show the real facts; you may be doing some one a great favor. But for the love of Mike find some other excuse than "dirty and inoperative."

Wheel Raising Device for Betts Journal-Truing Lathe

THE wheel-raising device, shown in the two drawings, is used in a railroad wheel shop to raise mounted wheels for rolling into position on a Betts two-carriage journal-truing lathe. As shown in the assembly drawing, the rails of the inbound track are hinged 15 ft. from the rear of the bed of the machine. The rails extend through the filler-block gaps of the machine.

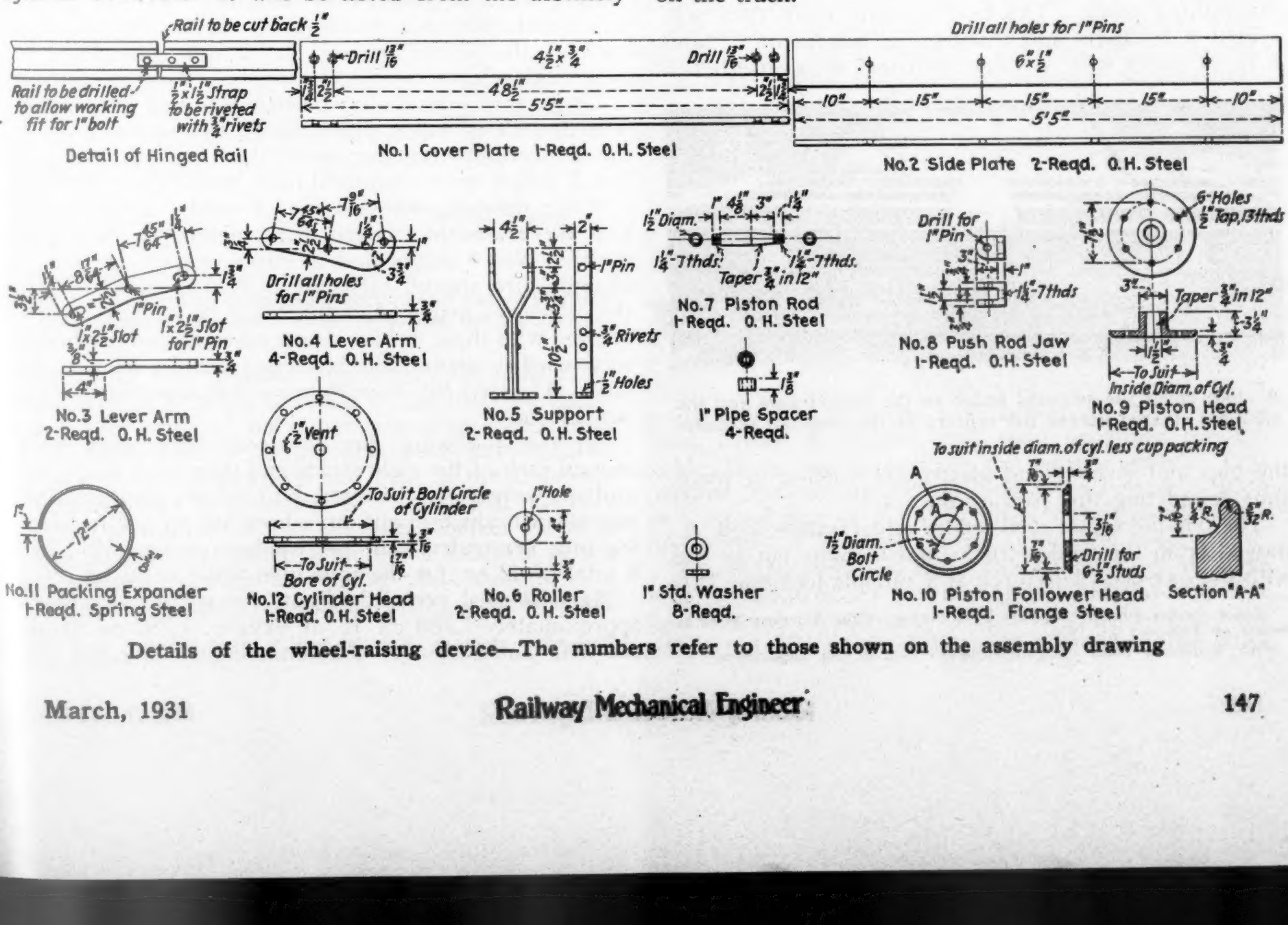
The wheels are rolled up the inclined track into position between the spindles. They are raised to the desired height by means of air pressure in the 12-in. brake cylinder, which raises the track and wheels through a system of levers. It will be noted from the assembly drawing that the upward movement of the track is brought about by upward movement of the brake-cylinder piston. The track is depressed by releasing the air in the cylinder which is exhausted by the weight of the wheels and track.

Only a short movement of the piston is required to locate the axle centers. Adjustment of the axle centers to the spindles can be made quickly and with little effort



Wheel-raising device for a Betts two-carriage journal-truing lathe

on the part of the machine operator; vertical movement of the wheels is obtained by operating the compressed-air valve and horizontal movement by rolling the wheels on the track.



Details of the wheel-raising device—The numbers refer to those shown on the assembly drawing

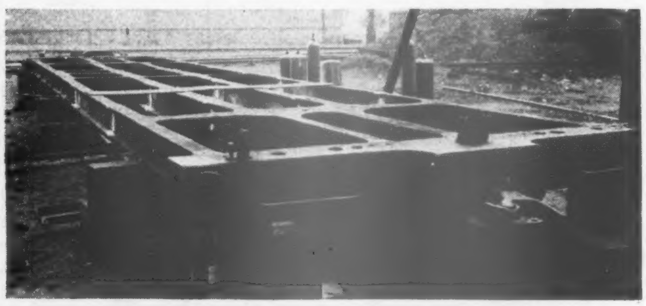
In the

Back Shop and Enginehouse

Tender Underframes* Lengthened by Welding

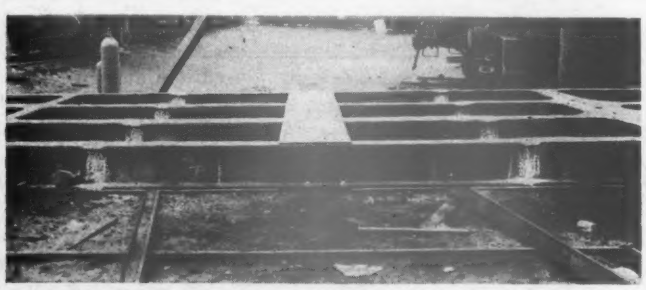
By E. V. David †

TO obtain tenders of increased capacity, demanded by the adoption of locomotives to longer runs and heavier trains, the Nickel Plate recently lengthened nine tender underframes and the tender tanks. It was desired to place the locomotives to which these tenders belonged on non-stop freight hauls between Conneaut, Ohio, and Buffalo, New York, and also between Conneaut and Bellevue, Ohio. The coal capacity of the tenders was already ample for the longer runs, but it was necessary to increase the water capacity. Estimates showed that the tanks would have to be lengthened by 8 ft.



One of the tender underframes after being lengthened by welding in four I-beam sections

Accordingly, the tanks were removed from tenders and cut in two with the oxy-acetylene torch at a predetermined point. The two sections were then separated 8 ft. apart and trammed in alinement. Plates 8 ft. in width with suitable stiffeners were inserted in the gap and riveted and electrically welded in place, thus completing this part of the job.



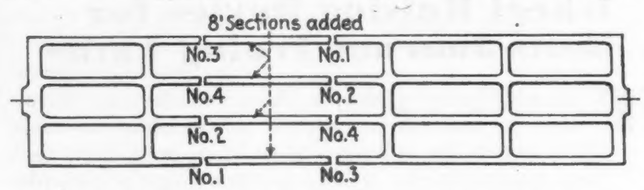
A close-up of the sections added to the underframe and the tie-plate riveted across the centers of the inserted sections

The one-piece cast-steel tender underframes were removed from the tender trucks and likewise cut in two with the oxy-acetylene torch at a suitable location. This entailed cutting of four longitudinal members of each underframe, each of I-beam cross section. Next, the two sections of underframes were separated 8 ft., blocked up about 3 ft. above the ground, trammed and brought into correct alinement with each other.

Cast-steel I-beams 8 ft. long, 12 in. deep and with the same cross section as underframe members, were placed in the gaps, held in place by clamps and oxy-acetylene welded at both ends to the tender underframe.

The appearance of an under-frame, after the welding was completed, is shown in one of the illustrations. The 8-ft. section inserted in each of the four longitudinal members, required a total of 8 welds per underframe. A close-up of sections added to the underframe is also illustrated. The points at which welds were made have been chalked to make them stand out more clearly. To further strengthen the underframe, tie-plates were riveted across the centers of the inserted sections.

In the welding procedure followed, due allowance was made for expansion and contraction in order to preserve the proper alinement of the underframe. The drawing show the order in which the welds were made. Four welders were actually working at the same time. After clamping the 8-ft. sections in place, two welders started work at each point designated as No. 1, and completed these two welds first. Next, the welds at each of the points marked No. 2 were completed by two welders.



The location of the I-beam sections added and the sequence of the welds made

Up to this juncture no tie-in welds had been made. The first tie-in welds which joined the two sections of the underframe together were the two designated as No. 3, which were completed next, each by two welders.

After finishing the two No. 3 welds, it was found that the frame had contracted together so closely at the two No. 4 points that it was necessary to build a charcoal fire around each No. 3 weld in order to give the expansion required at the No. 4 points before proceeding with these welds. Sheet asbestos and fire bricks were used to protect the welders from the heat of the fires. The two No. 4 welds were then completed without difficulty.

On the following day, charcoal fires were built around each of the eight welds and they were heated simultaneously to a cherry red to relieve and equalize any strains which might have been set up. The welding time per underframe per welder averaged 10½ hr., a total of 42 hr. for the four men being required.

Material used per underframe for welding averaged approximately 1,780 cu. ft. of oxygen, 1,780 cu. ft. of acetylene and 90 lb. of vanadium steel welding rod. In

* Paper presented before the New York Section of the American Welding Society on February 24, 1931.

† Air Reduction Sales Company, Applied Engineering Department.

addition, an average of approximately 100 lb. of charcoal was required per underframe for heating the two No. 3 sections while welding at the two No. 4 points, and 200 lb. of charcoal for heating up all welds to a cherry red on the following day, to relieve and equalize strains. Firebrick and sheet asbestos were employed as required.

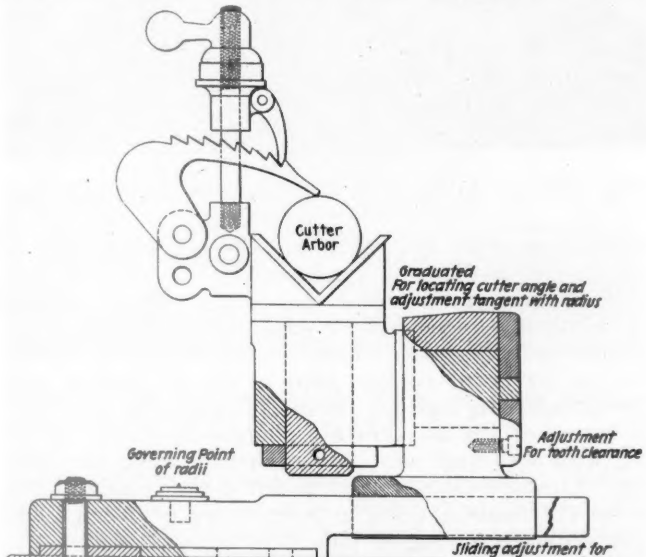
Assuming average unit costs, the following table gives an estimate of the total oxyacetylene welding cost per tender underframe.

Labor:		
42 hr. welding time @$.80 per hr.		$33.60
Material:		
1,780 cu. ft. oxygen @ $1.25 per C	$22.25	
1,780 cu. ft. acetylene @ $2.50 per C	44.50	
90 lb. vanadium-steel rod @ $.22 per lb.	19.80	
100 lb. charcoal (while welding) @ $.02 per lb.	2.00	
200 lb. charcoal (heat-treating) @ $.02 per lb.	4.00	
Firebrick, asbestos paper, etc. (estimated)	1.00	
Total material, per underframe		93.55
Total labor and material, per underframe		$127.15

Fixture for Grinding Cutters and Reamers

*By Frank R. Esser**

SHOWN in the illustration is a fixture for sharpening channeling cutters and radius reamers on a universal guide without removing the blades. This fixture can be used to advantage especially in shops not equipped with special-purpose grinders for sharpening large channeling cutters. It can be used on a universal or plain cutter and reamer grinder and will answer the purpose in every particular. Anyone confronted with this problem appreciates the difficulties encountered in grinding the radii on the inserted blades so that they will not only maintain proper clearance, but will blend with the peripheral and side-cutting faces.



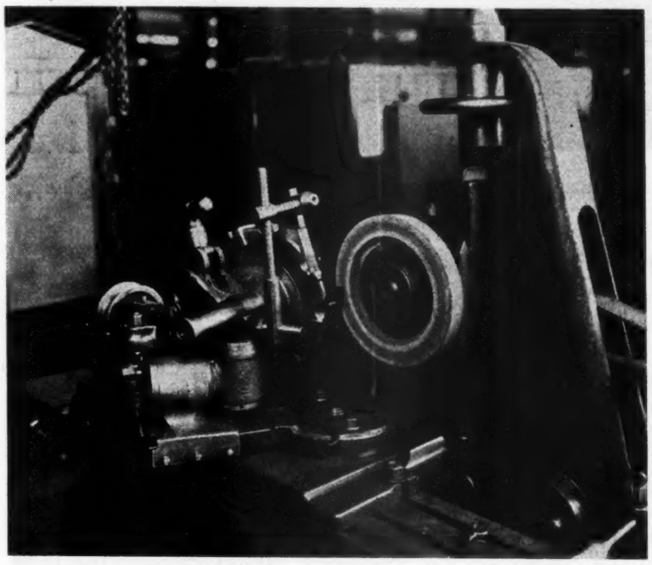
Fixture for sharpening channeling cutters and radius reamers on a universal grinder without removing the blades

This fixture was designed and built at the Delaware & Hudson shops at Colonie, N. Y., and will not only take care of the radius, but will also sharpen the sides of the blades. Periphery grinding is handled in the usual manner as when sharpening plain cutters.

The rotating base has for its pivoting point three discs in step sizes, each one of which is the true radius of the inserted cutter blades to be ground. For every variation in radius a corresponding disc must be provided or proper allowance made from the dead center.

In setting up for grinding, the table is adjusted so that the edge of the disc (for inserted cutter blades of identical radius) is in direct vertical alinement with the side or cup face of the grinding wheel. The table is then locked in position. The cutter, mounted on a mandrel, is then placed in the holding fixture with the extreme radius of the blade touching the wheel at a point plumb with the edge of the disc. This automatically sets the proper radius for grinding. An adjustable tooth rest insures uniformity.

The radii on opposed inserted cutter blades are ground in the same manner as described by reversing the cutter arbor and adjusting the Vee-type holder 90 deg., which brings the opposite side of the cutter tangent with the opposite side face of the grinding wheel.



Application of the fixture showing the rotating base

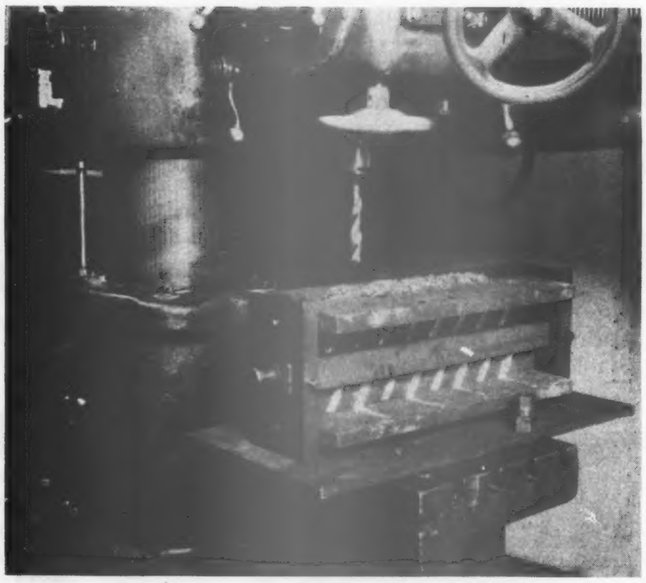
Staggered-tooth milling cutters 12 in. in diameter can be ground. Radii as small as ⅛ in. are accommodated. The following tools can be accurately ground with this fixture: Milling cutters, spherical-joint reamers up to 6 in. radius; by-pass valve reamers; superheater-unit joint reamers; crank-pin counterbores, and ball-bearing forming tools.

* Mr. Esser is shop engineer at the Colonie, N. Y., shops of the Delaware & Hudson.

Crosshead and Piston Drilling Jigs

MOST of the wear on the top crosshead shoes of locomotives equipped with the alligator-type crosshead is lateral, and, in order to secure maximum service life from the Hunt-Spiller shoes used on a great majority of large locomotives of the Chicago, Rock Island & Pacific, this road machines the top guide ¼ in. narrower than the bottom guide. This permits transferring the top shoe to the bottom as soon as a lateral play of ¼ in. develops and obtaining a second period of effective service from each shoe.

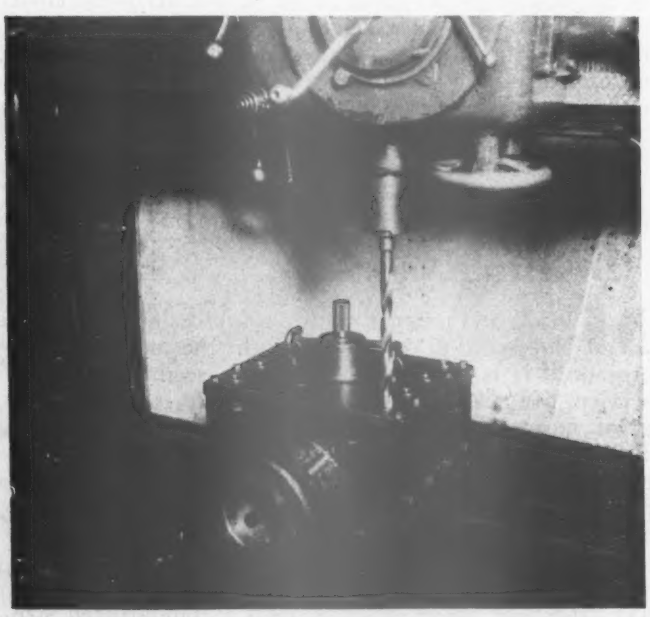
The practicability of thus interchanging top and bottom crosshead shoes depends upon a standardized size and location of bolt holes. This is secured by the use of special jigs at the Silvis (Ill.) shops of the Rock



Jig used in drilling crosshead-shoe bolt holes at Silvis shops of the Rock Island

Island, as illustrated, six sets of these jigs being sufficient to cover most of the classes of heavy power on that road.

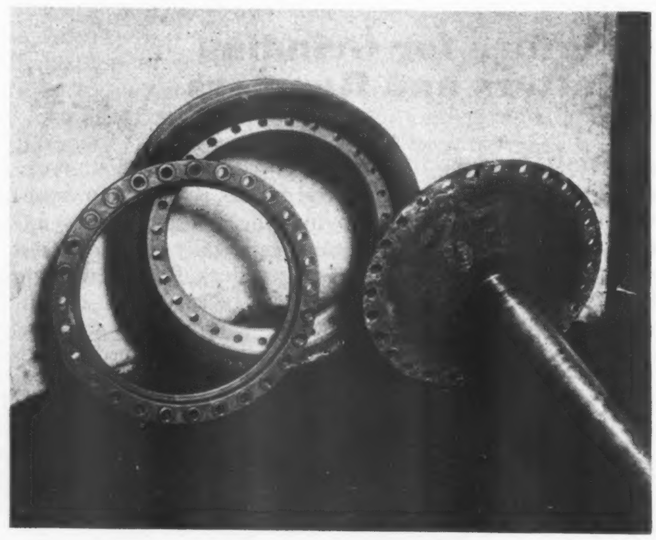
For drilling crosshead shoes, the jig consists of a substantial steel plate with the ends bent at right angles and spaced to receive the shoe with very little clearance, or end play, which can be taken up by two set screws, as shown. The ends are slotted to accommodate a narrow steel bar which holds the shoe firmly against the back of the jig by tightening two additional set screws. The back plate of the jig has two steel ribs, corresponding to the cheeks of the crosshead, which fit over the part of the shoe where holes are to be drilled and accurately positions the four 1-in. holes by means of hardened steel bushings, properly located. The ends of the shoe jig are equipped with centrally-located pins for use with a lifting hook in conveniently handling the jig from the floor to the drill table, or revolving the jig and shoe to any position desired on the drill table. Obviously, the use of this jig assures the standard size and location of bolt holes in crosshead shoes, at the same time saving the labor and expense of laying out holes which would otherwise be required.



Crosshead drill jig which assures standard location of bolt holes

Crosshead Drill Jig

To secure a standard location of bolt holes in the crosshead, also, the crosshead jig, shown in the second illustration, is used at Silvis shops. It is of built-up steel construction, comprising primarily a housing to receive the crosshead, with eight hardened-steel bushings accurately positioned in the top plate, and four bushings in each of two ribs, or projecting plates, on the inside. The crosshead is properly located in the jig by means of a round plug, the upper knurled end of which is shown, extending through a hardened and ground bushing applied to the wrist-pin hole. The slightly elliptical hole in the crosshead jig, proper, permits a small amount of lateral motion of the crosshead, but accurately positions it longitudinally to give the correct location of crosshead shoe holes. The crosshead is held firmly in position by clamp bolts and the holes drilled in both cheeks of the crosshead at one setting.



Ring drill jig used for drilling piston centers and bull rings

This jig is, of course, used in the drilling of new crossheads. In case the crosshead bolt holes are worn in excess of 1¼ in., they are plugged by electric welding with soft steel wire, and re-drilled, using the same jig. After the shoes are assembled in the crosshead, the holes are reamed, using a taper of $\frac{1}{16}$ in. per ft. and bolts fitted in an engine lathe.

Not only does this drilling arrangement permit getting a double service life from the Hunt-Spiller crosshead shoes, but the interchangeability permits sending shoes to outlying terminals with the assurance that they can be used on locomotives of a specified class and thus, in some instances, avoids locomotive delays.

Drill Jig for Piston Bull Rings

The cast-steel centers of locomotive pistons seldom break, but the cast iron bull rings are subject to more or less rapid wear and have to be renewed, which involves drilling them, in some instances, for as many as 28 rivets. The necessity of having holes in the bull ring drilled with considerable accuracy is apparent, and one means of doing this is to use the piston bull ring as a templet during the laying out or drilling operation. In case the piston rod is still in the piston center, how-

ever, this is an awkward operation, and a much more quick, accurate and generally satisfactory method is to use the comparatively light ring drill jig, illustrated. This is made of steel with hardened-steel bushings pressed in and located so as to provide for the proper number of rivet holes properly located.

The ring drill jig has, on one side, a recess corresponding to the shoulder on the piston center and, on the other side, a shoulder which just fits into the smallest diameter of the bull ring. The ring can thus be used with one face against the piston center, or the other against the bull ring, while holes are being drilled, with every assurance that the holes will line up exactly when the piston center and bull ring are assembled for riveting.

Sandblasting

EFFECTIVE use of a sandblast shed and equipment is being made at the locomotive shops of the Chicago, Burlington & Quincy at West Burlington, Iowa. This shed, illustrated, is approximately 30 ft. wide by 80 ft. long, being constructed of sheet iron on a timber frame. Shop air pressure is piped to the shed through a three-inch line which makes approximately 90 lb. pressure available. In one corner of the shed is a storage bin for the white silica sand shipped to the

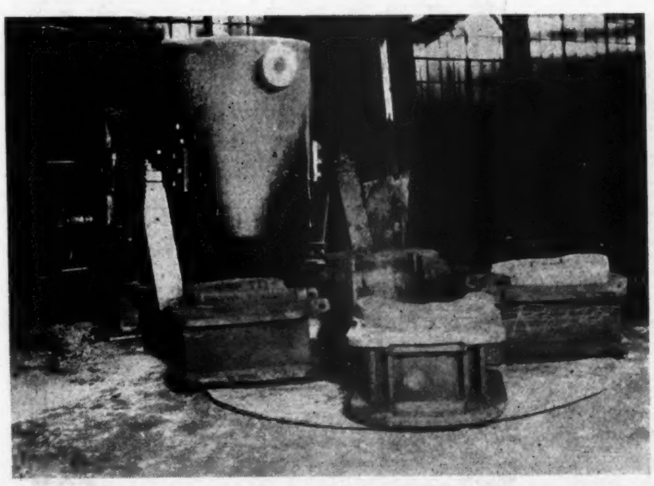
Sand blast shed and loaded push cars at the West Burlington (Iowa) shops of the C. B. & Q.

shop in carload lots and used for sandblasting. While a sand drier is installed in the shed and was at one time used, this practice has been discontinued as unnecessary with sand of average moisture, and, consequently, sand from the storage bin is simply shoveled to a vibrator which eliminates any foreign material or excessively large pieces. From the bottom of the vibrator, sand is delivered through a 2-in. pipe by air pressure to the top of a sandblast container or drum, 36 in. in diameter by 50 in. high. By means of a gate valve, the sand in the top of the container can then be passed by gravity to the mixing chamber or tank underneath. The gate valve is closed, and air pressure applied, sand feeding by gravity and air pressure to the syphon underneath the mixing tank, where it mixes with the stream of air at shop air-line pressure and is conducted through a 1½-in. rubber hose to the nozzle pipe and the parts to be sandblasted. Two nozzle pipes, which can be used simultaneously from this machine, are ½ in. in diameter. A service life of approximately three months is secured from the hose, but the pipe nozzles cut out usually in a few hours. The sandblast operator has an assistant who works the sand and dust over on the floor and gradually gets that sand which is suitable for re-use back toward the vibrator.

Approximately thirty locomotives a month are normally handled at West Burlington shops, and a large part of the locomotive equipment, including frames, cylinders, boilers and accessories, is sandblasted. Stripped locomotives, mounted on their front and back trucks, are moved into the sand house, except on quiet, fair days when the work may be done out of doors. Locomotive tenders and tanks are sandblasted preparatory to repainting. Small parts are loaded on push cars for movement between the shop and the sandblast shed. The boilers are sandblasted inside and out, which has the effect of thoroughly removing dirt and scale and permitting the detection of any flaws in the steel, such as cracks, and plates with an undue amount of pitting or corrosion. Air pumps are sandblasted, also the exteriors of airdrums, jackets, etc. Pistons and crossheads, after going to the lye vat for the removal of most of the grease, are sent to the sandblast shed and sandblasted. While sandblasting the interior of a boiler, a motor-driven fan is used to get rid of the sand in the atmosphere and, in fact, this is the only means by which the operation can be carried on. By starting at the front end and adjusting the fan to blow the sand-filled air toward the firebox end, reasonably satisfactory working conditions can be assured.

Turntable for Pouring Hub Liners

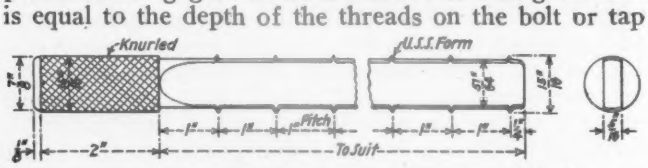
IN the illustration is shown a trunion-mounted brass-melting furnace in front of which is set a table, capable of supporting eight of the largest sized driving boxes each of which may be rotated in turn before the spout of furnace during hub-liner pouring operations. The turntable is 7 ft. in diameter and is mounted on a roller- and ball-bearing stud, pressed into the bored center of a scrap 26-in. cylinder head. The cylinder head, which forms the base of the turntable, is anchored in concrete with 1⅛-in. bolts. The turntable is constructed of a thin cast-iron plate set on a discarded bull gear, 6 ft. in diameter, which in turn is mounted on the ball-bearing stud fitted in the cylinder head.



A turntable set before a brass-melting furnace which rotates driving boxes before the spout of the crucible

Gage for Testing Pitch of Threads

A SIMPLE but effective gage for checking the pitch of threads on staybolts, taps, etc., is shown in the drawing. The gage is made to suit any specific application desired, the pitch of the threads being the distance between each of a series of raised thread-like points on the gage. These are raised to a height which is equal to the depth of the threads on the bolt or tap



A gage which is designed to check the pitch of threads on staybolts, taps, etc.

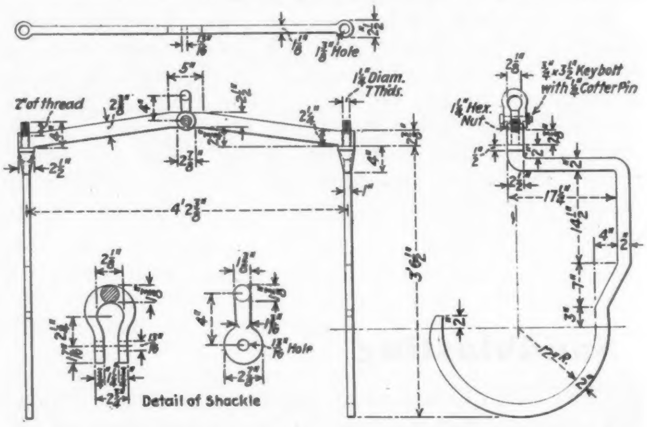
for which the gage is designed. The points are 5/16 in. long and are located on opposite sides of the gage for convenience when the gage is in use.

The length of the gage is made to suit any particular application for which the gage may be designed. It has a knurled handle, 2 in. long and 15/16 in. in diameter. When in use the gage is laid along the threads of the bolts or tap, as the case may be, and the raised pitch points will all fall in its respective thread if the pitch is correct.

Device for Lifting Air Reservoirs

IN enginehouses and back shops diverse means are employed for lifting air reservoirs into position beneath running boards. A device which is designed to expedite this operation is shown in the drawing.

The device is made with two J-type hangers bolted to a cross member, in the center of which is attached an inverted-U shackle for the insertion of a crane hook. The J-type hangers are constructed of 1-in. by 2-in. steel, that portion of the hanger for supporting the reservoir being bent to a 12-in. radius. The two hangers are spaced at a distance of 4 ft. 2⅜ in. by a cross beam made from 2⅜-in. by 1⅛-in. steel with an eye forged at each end. The top of the J-type hangers are bent as shown in the drawing and threaded to permit bolting them to the cross member. They are designed to permit the equalization of the suspended load and with a



A device for lifting air reservoirs into position beneath running boards

4-in. offset in the vertical stem of the J for running board clearance.

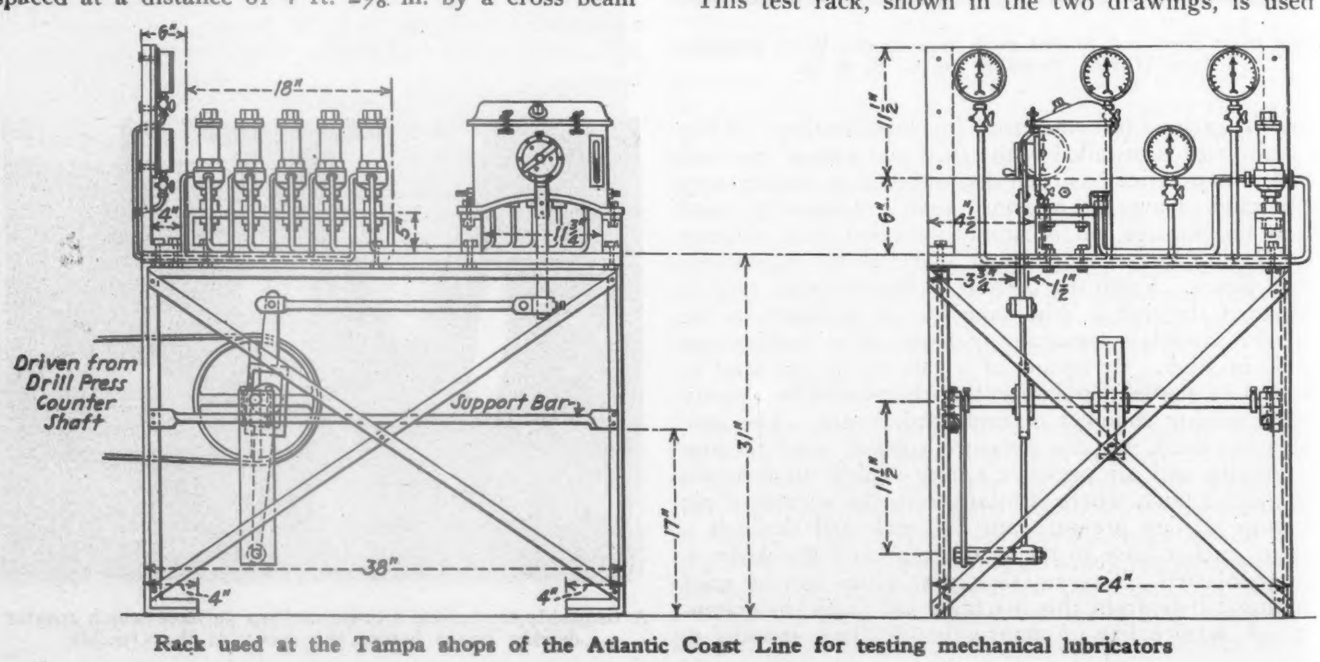
Although the lifting device was primarily designed for raising air reservoirs into position on locomotives in the round houses, where the running board is seldom removed, it can be used in back shops in place of chains, thus removing a safety hazard.

Test Rack for Nathan Mechanical Lubricators

By E. G. Jones

THERE are a number of mechanical-lubricator test racks in various shops, but most of them are quite expensive to build and are not simple. The one used at the Tampa, Fla., shops of the Atlantic Coast Line is simple in construction and economical with respect to the cost of building.

This test rack, shown in the two drawings, is used



Rack used at the Tampa shops of the Atlantic Coast Line for testing mechanical lubricators

for testing Nathan mechanical lubricators where five feeds are used on the locomotive. However, by the addition of terminal checks, gages and piping more feeds may be tested. This rack can also be used for testing other mechanical lubricators by re-arranging the delivery pipes to the terminal checks.

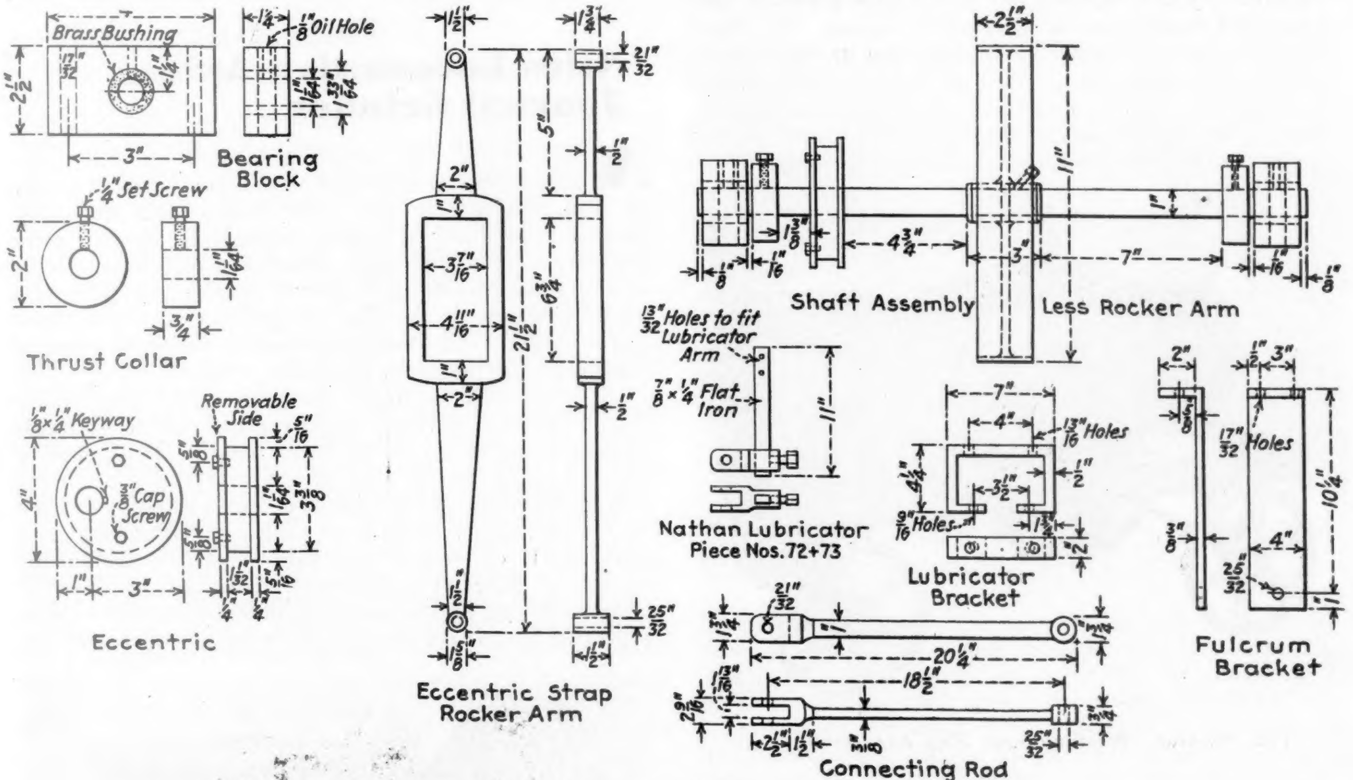
The test rack is placed near a drill press and its drive motion is obtained from the countershaft of the machine. In our case, the shop is electrified and each machine has its individual motor and, where there was no overhead countershaft or motor available, the drill-press countershaft was used. This gives us various working speeds by changing from one cone to another.

The driving mechanism of the test rack is simple and close measurements are not absolutely necessary. The eccentric and eccentric-strap rocker arm are preferable to a crank arm. Any desired valve travel, of which there is a variety owing to the design of the eccentric throw, may be used on the test rack. The rack is not bolted to the floor, for it must be lined up when the driving cones are changed. When not in use, it may be moved away from the press.

After a lubricator is placed on the rack and properly bolted down and connected to the pipes, the oil-delivery pipes are filled by cranking the lubricator by hand with the feed-adjusting screws wide open, thus speeding up the operation. When the delivery oil shows up at the bottom of the terminal check, the drill-press countershaft is put in motion and the pulsation of the gage hand noted. This indicates strong and weak pump units in the lubricator. The adjusting screws are then set to the average working speed of the locomotive and checked by noting the number of drops of oil per minute through the delivery end of the terminal check. The delivery oil is caught in a small drip pan placed under the terminal checks.

When the setting of the lubricator pump units is completed, the driving motion is stopped and the oil pressure on the gages noted. After an appreciable length of time has lapsed, the pressure is again noted and, if found to have decreased, it shows that the delivery-ball check of the lubricator is leaking, provided that the terminal check is not leaking, which, if defective, shows up by an occasional drop of oil at the delivery feed.

After the test is completed, weak pump units are replaced and defective delivery checks are repaired. As already stated, the lubricator can be adjusted and the feeds regulated before it is applied to the locomotive. With this scheme of testing, the results of the adjustments can be observed and guesswork eliminated.



Details of the rack for testing Nathan mechanical lubricators

The oil used in testing lubricators on the test rack is a heavy gas-engine oil, the viscosity of which is practically that of valve oil when heated by means of the heater pipe in the lubricator.

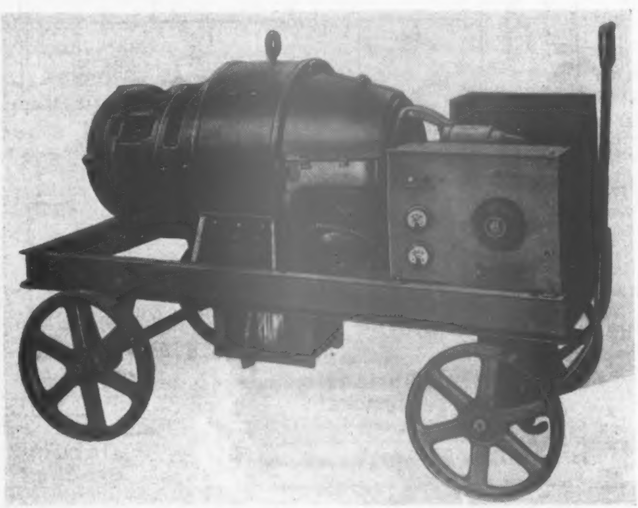
The frame of the rack is made of 1½-in. by 1½-in. by ¼-in. Tee-iron. It can be made of 2-in. by 2-in. by ¼-in angle iron. The cross braces of the frame are made of 1¼-in. by ¼-in. flat iron, and the bearing support bar of 2-in. by ½-in. flat iron. The terminal-check bracket is of 2-in. by ½-in. flat iron, and the gage bracket stand is made of 2-in. by ⅜-in. flat iron. The gage bracket back cover is made of $\frac{3}{16}$-in. sheet iron. The top of the rack is covered with $\frac{5}{16}$-in. sheet iron which is welded to the frame. The three gages are Crosby 5-in., 500-lb. double spring. Nathan Type D terminal checks are used.

Fifty Years Ago.—It is but a few years since 20,000 lb. was considered the maximum load for a freight car, but the figures of the western weighing association show a remarkable increase in this respect. During six weeks nearly 50,000 cars were weighed, and while the average of the different classes of freight ran from 23,750 lb., for machinery, to 29,925 lb., for ore, the maximum in nearly all cases exceeded 30,000, and for some classes of freight reached, respectively, as high as 39,600, and even, in the case of ore, to the enormous weight of 48,500 lb.—*Railway Age*, October 28, 1880.

NEW DEVICES

Westinghouse Flex-Arc Welders

THE Westinghouse Electric & Manufacturing Company recently brought out a series of single-operator welding sets incorporating a feature known as the Flexactor, which is designed to produce a steady, uniform and flexible arc at all current values. The Flexactor is a special form of reactance and its principle of operation is to lessen the time of voltage recovery and to eliminate current surges at the striking of the arc, thus preventing sticking of the electrode. By eliminating current surges, the Flexactor is designed to prevent arc explosions and overshooting of the ultimate current value during momentary short circuits due to passage of metal through the arc.



The 300-amp. Westinghouse Flex-Arc welding set

The single-operator sets have a common frame and common shaft for the motor and generator with ball bearings on the generator end and roller bearings on the motor end. A separate exciter is overhung from the motor end. The control units are mounted on the side of the set, in an integral part of the frame and protected by a sheet-steel panel. The Flexactor is mounted underneath the frame.

The welding unit illustrated has a rating of 300 amp., 1 hr., 50 deg. C. rise on resistance load at 25 volts in accordance with N.E.M.A. standard practice. The welding range of the unit is from 90 amp. to 375 amp. The generator is the standard Westinghouse SK type using constant current and is differentially wound and separately excited. A Linestart 15-hp. motor is used which operates on dual voltage, 220 or 440 volts, 25, 50 or 60 cycle, 2 or 3 phase. A 550-volt motor, 3 phase, 50 or 60 cycle, can also be used.

The generator field rheostat, ammeter and voltmeter, together with the motor starter, are all mounted in an enclosed sheet-metal cabinet which is an integral part of the unit frame. The capacities of the instruments are 600 amp. and 125 volts. The Westinghouse Linestarter motor control used is operated by a push button and has overload and low-voltage protection and is mounted in a steel cabinet. The exciter used in conjunction with the welding unit is the standard Westinghouse CD type, 125 volts, and is d.c., compound wound.

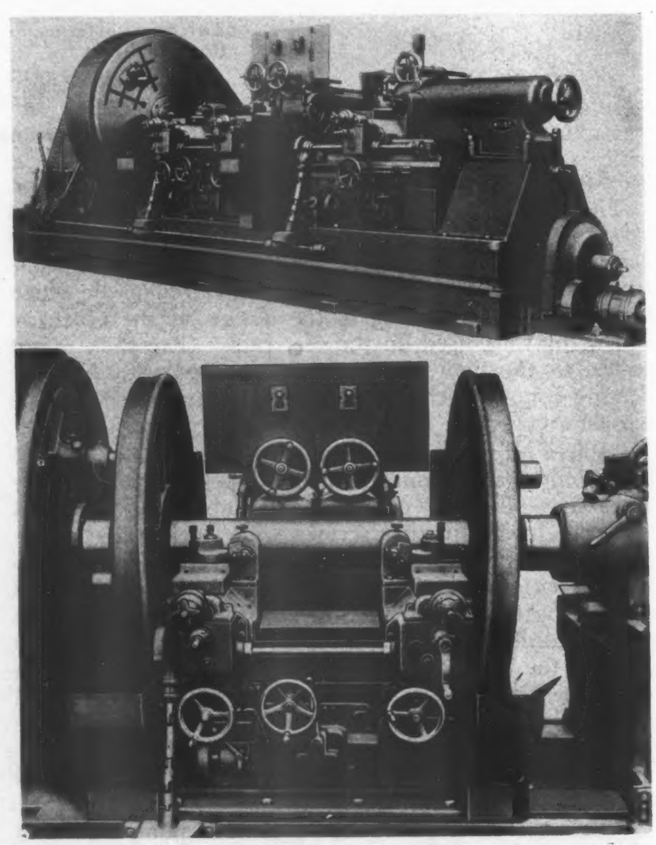
The 300-amp. single-operator welding unit weighs 2,000 lb. and is 60 in. long, 37 in. wide and 44 in. high. This welding unit is also built in a 200-amp. size.

Niles Locomotive-Axle Journal Grinder

A MACHINE for grinding locomotive axle journals, which is arranged with a combination grinding and cutting rest for either independent or simultaneous refinishing of inside journals is shown in the illustration. This machine, which can also be arranged with a similar rest for finishing outside journals, is a recent addition to the line of products manufactured by the Niles Tool Works Company, Division General Machinery Corporation, Hamilton, Ohio.

The machine is arranged to swing wheel sets having 90-in. diameter drivers and to grind inside journals ranging from 12 in. to 18 in. in length. The grinding unit is located at the rear of the rest and the cutting tools at the front of the rest. The cutting tools are used for facing hub liners and for taking an initial cut over badly worn or scored journals so as to lessen the amount of material to be removed by the grinders.

In the design of the machine, precautions were taken to protect the wearing surfaces from the abrasive; de-



Top: General view of the Niles locomotive-axle journal-grinding machine—Bottom: The journal-grinding units

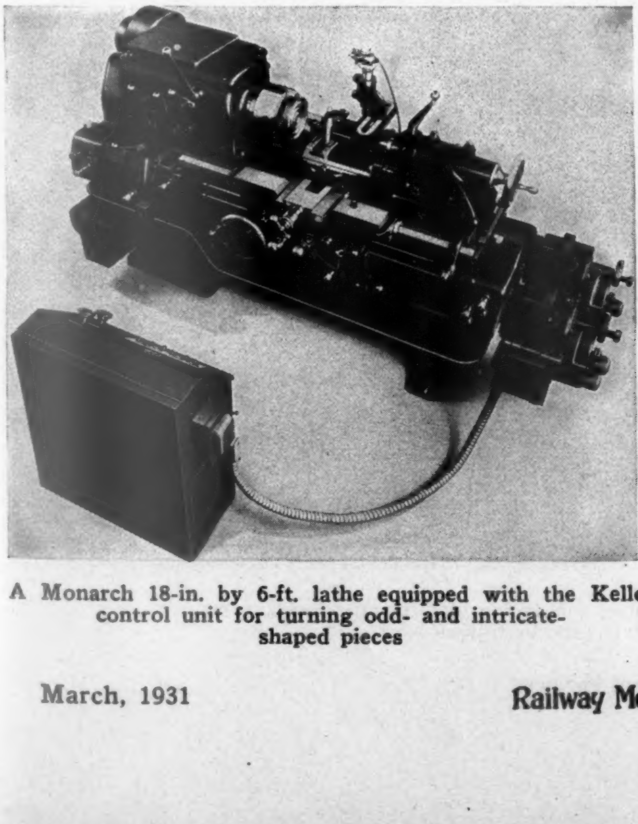
tailed attention being given to the control of the fluid compound and the proper collecting of this fluid in the bed for recirculation. Thirty minutes floor-to-floor production has been effected with this machine. One test installation of the machine was made in 1929 and the results obtained were such that two similar machines were installed during 1930. Wheel sets after operating 125,000 miles were removed for driving-box, hub-liner and tire repairs and were replaced without the necessity of regrinding the journals.

Monarch-Keller Form-Turning Lathes

THE Monarch Machine Tool Company, Sidney, Ohio, recently announced an arrangement with the Keller Mechanical Engineering Corporation, Brooklyn, New York, by which the two companies have collaborated in building a form-turning lathe. This machine combines the Keller electrical control units and the Monarch lathes, so that they are "built-in" to form a complete unit, for turning odd or irregular shapes.

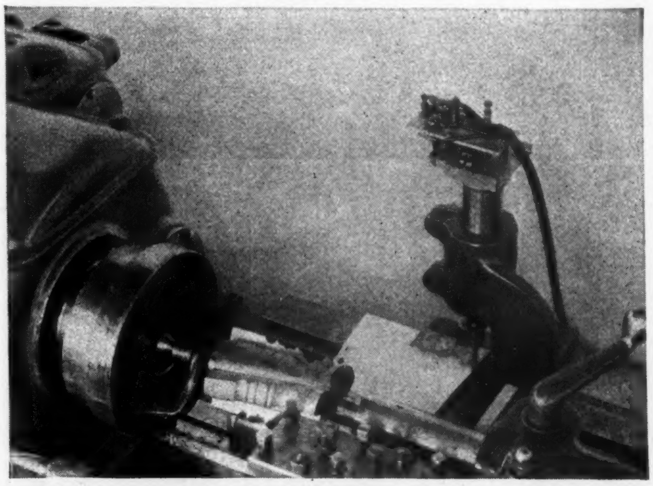
The Keller control unit consists of a tracing device, two Keller magnet boxes, and a control cabinet. The tracing device is mounted on the carriage of the machine and is always in a fixed relation to the cutting tool. A thin metal template, the outline of which represents the shape to be machined by the lathe, is mounted on a bracket at the back of the lathe, parallel to either the longitudinal or cross feed, depending upon the position of the work in the lathe, whether between centers or on a face plate. The tracer follows the template, and being magnetically controlled and attached to the carriage, it controls the movement of the cutting tool in and out. Thus, the tool follows the direction actuated by the tracer, making the shape in the lathe an exact replica of the template.

The magnet box of the controlling unit is geared to the feed rod of the lathe. The control unit is operated by a 14-volt control circuit and is opened or closed by the action of the tracer. A spring on the tracer contact lever holds the tracer normally in a closed position and closes the side of the 14-volt control circuit which energizes an "in" relay. The "in" relay engages a magnetic clutch which operates the cross feed in. When the machine is in operation, the cross feed is therefore normally running in. When the piece being machined requires the outward movement of the cross feed, the tracer following the template engages an "out" relay, engaging the "out" magnetic clutch which reverses the former direction of the cross feed. If the shape of the template should be parallel to the lathe bed, the tracer contacts will be neutral so that the lathe is turning a cylindrical shape.



A Monarch 18-in. by 6-ft. lathe equipped with the Keller control unit for turning odd- and intricate-shaped pieces

The Keller automatic control can be applied to all types of Monarch lathes. It must be mounted and wired at the factory and, being a built-in feature, cannot be applied readily to lathes now in use. A lathe thus equipped is especially adapted for die and metal making and for turning odd- and intricate-shaped pieces.



A spirally-fluted milling cutter machined to shape on the Monarch-Keller form-turning lathe—Note the tracer and template mounted on the lathe carriage

Following are some of the classes of work which can be economically completed on these lathes: die casting dies; all classes of spinning chucks; punches and dies; composition mould dies; sheet-metal bending rolls; machining blanks for form-milling cutters; relieving spirally fluted form-milling cutters; and turning or facing special shapes in any form for which a thin master template can be made.

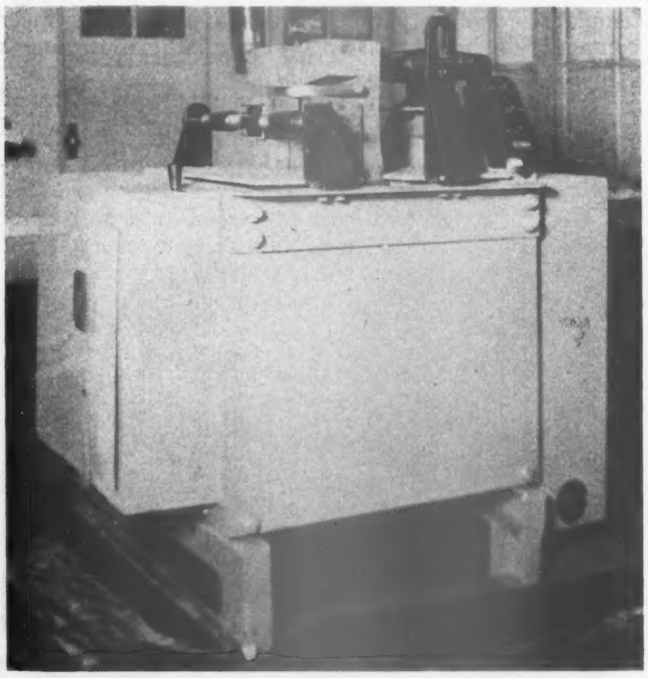
Berwick Electric Metal Heater

THE American Car & Foundry Company, New York, recently added to its line of products a heater built along the same general lines as the a.c.f. Berwick electric rivet heater, the new product differing in the fact that instead of having one path or two metal points for the current, there are two paths with four metal points. Two of the contact points form the lower electrode on which rests the piece to be heated. The lower electrode is in the same plane as the upper electrode, which has overhanging lips that press down on the upper portion of the periphery of the piece being heated, holding it in position during the heating process. The upper electrode, or secondary electrode, is in two halves, of horseshoe shape, and set as close as possible to a core of silicon steel.

The heater is constructed with the electrode in open view, thus permitting the operator to see clearly the piece of steel heating. It can be designed to specifica-

tions to obtain end heating, and also any desired length of heat at any spot on the bar or rod.

The time of heating depends entirely upon the size of transformer, the diameter of the stock to be heated, and the length of heat. A 1-in. steel bar, with a 6-in. length of heat, takes 1¼ min. per electrode. If a heater



The Berwick electric metal heater—Note the piece of round stock heating between the electrodes

were furnished with three electrodes, there should be three of these pieces per minute; if a heater were furnished with five electrodes, there should be five pieces per minute. Small sizes would be heated in less time, while larger pieces would take a longer period of time.

The electrical consumption usually runs from 18 to 20 kw.-hr. per hundred pounds of metal heated, but this is more or less dependent upon the period of time it takes to heat the stock. When heating long stock, of large diameter, the radiation of the piece during the process of heating may cause these figures to be increased.

Power Rail-Car Flange Oiling

Excessive wear on the flanges of power rail-car wheels, as well as those of electric locomotives, is said to be eliminated by application of a new design of oscillating control applied in connection with the locomotive flange oiler, made by the Hoofer Manufacturing Company, 4710 Armitage avenue, Chicago.

This flange oiler, of the pneumatic type, uses relatively inexpensive low-grade oil which is applied by means of oil shoes, each of which has an oil passage leading directly to the point on the flange where lubrication is most needed. Asphaltum road oil No. 3 is recommended for winter and No. 4 for summer, this oil being of a heavy consistency which causes it to adhere to the flanges and not congeal in cold weather.

The Hoofer equipment for oiling the flanges of power rail-cars, or similar electric-driven equipment, is shown in the illustration. In the cutaway section, at the upper right corner of the illustration, is shown the pressure-control valve, through which air passes from the main reservoir of the air-brake system to the Hoofer flange oiling equipment. The flange oiler itself is suspended from suitable brackets, rigidly bolted to the underframe of the car, flexible oil pipes leading to the oil shoes on the truck wheels. The oscillating control unit consists of a special valve actuated by a rod and bracket connection to the truck. The bracket connection to the truck frame, in central alinement with the bolster and center casting, is shown by the arrow at the right, and the swivel head, by means of which the quantity of oil delivered is adjusted to feed about one-half pint for each wheel per hundred miles, is indicated at the left arrow.

In operation, air pressure from the main reservoir, which may vary from 80 to 130 lb., is reduced at the pressure control valve to about 5 lb. in excess of the normal brake-pipe pressure. The design of the oscillating control unit is such that each time an oscillating movement takes place between the truck and the body of the vehicle, the control valve is opened, permitting a certain amount of air to pass to the flange oiler proper, operating the discharge pistons and carrying a certain amount of oil to the flanges. The flange

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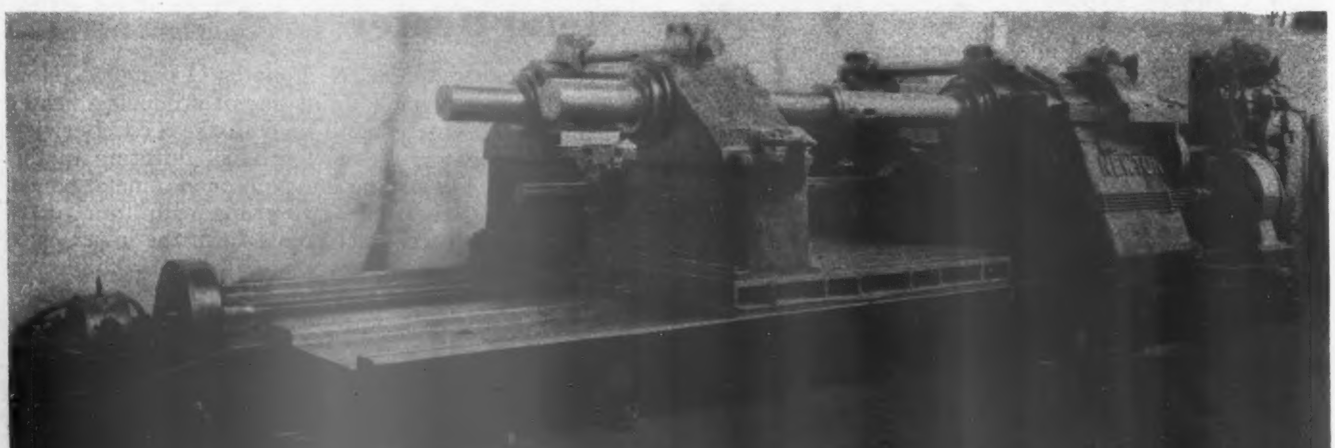
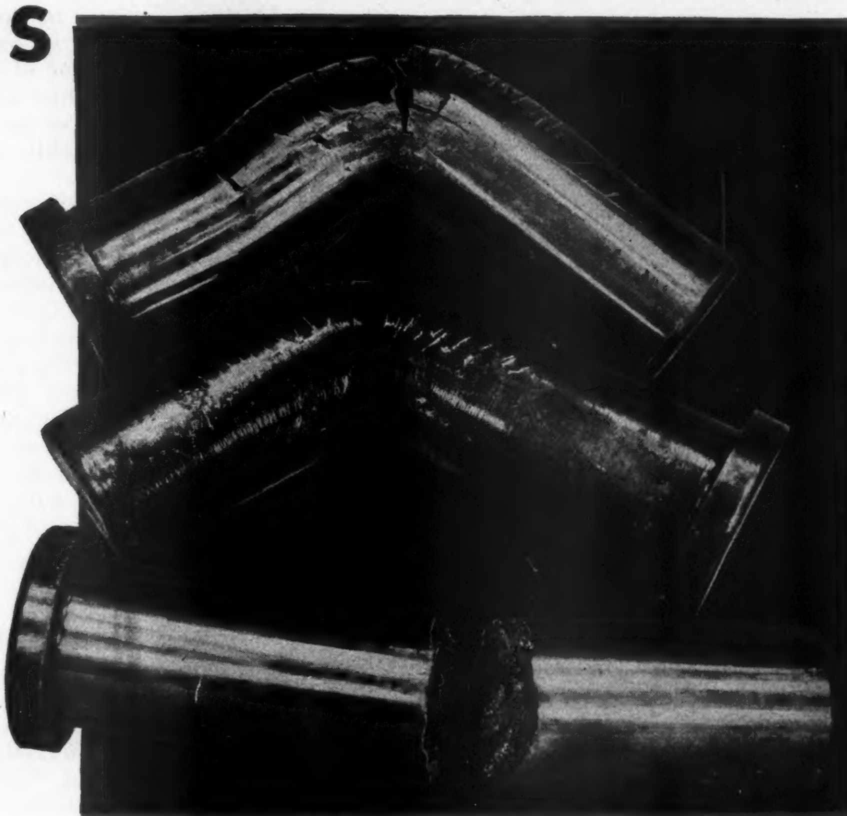


Newton three-spindle horizontal boring machine for facing and counterboring large fabricated welded-steel electric-motor frames

CASE-HARDENED PARTS NOW COST LESS



All three spring hanger pins were carburized for 8 hours, quenched in water and broken under a steam hammer. Note the toughness of the Agathon Nickel Iron.

AGATHON NICKEL IRON

Gives A Better Case At A Lower Cost

■ Alloy irons and steels developed by Republic metallurgists are already improving the service of many car and locomotive parts.

■ Now comes Agathon Nickel Iron to remove many case-hardening difficulties and reduce the cost of case-hardened parts.

■ Not only does this material take a fine case but the core is unusually tough and uniform. There are no slag spots or seams and warping is almost negligible.

■ With this improved material, pins and bushings may be machined to size, polished, carburized and quenched from the pot without spoiling the surface for smoothness.

■ Grinding is unnecessary and the finished cost with Agathon Nickel Iron is lower.

■ Wherever you use case-hardened pins and bushings try Agathon Nickel Iron.

Central Alloy Steel Division

REPUBLIC STEEL CORPORATION

MASSILLON, OHIO

oiler, or lubricator, is equipped with four of these discharge pistons so that oil can be supplied to the oil shoes and flanges on both the front and back wheels for operation in either direction operation, if desired.

The adjustment of the swivel, or control head, at the left arrow, is made to suit the curvature of the track and regulate the frequency at which the lubricator will operate. The amount of oil discharged may also

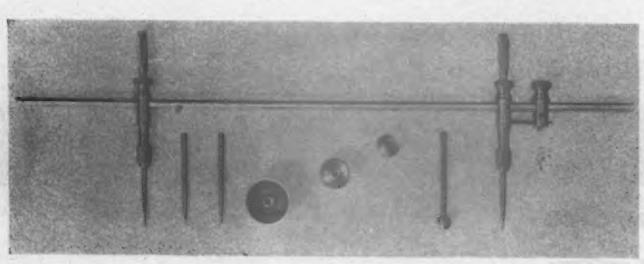
Hoofer flange oiler and oscillating control unit as applied to a power rail car

be regulated by feed nipples of greater or lesser capacity. A strainer, suitably located in the feed line to the operating valve, prevents scale and other foreign matter from interfering with its operation. The design of the lubricator, itself, also provides a mechanical means for clearing the restricted passages in the discharge piston and thus promotes reliability of operation. The oil shoe riggings are furnished with right and left shoes, which may be installed in either a declined or an inclined position, whichever is more convenient. The fact that the air current used in this flange oiler has been somewhat warmed during compression, and then passes with the oil through the oil lines and the oil shoes, contributes to the successful operation of the oiler in winter months.

Starrett Trammels With Steel Beams

METAL workers, draftsmen, lay-out men and others whose work demands precision in long measurements will be interested in a trammel now being manufactured by the L. S. Starrett Company, Athol, Mass.

The No. 251 Starrett trammel presents a number of



The No. 251 steel-beam Starrett trammel

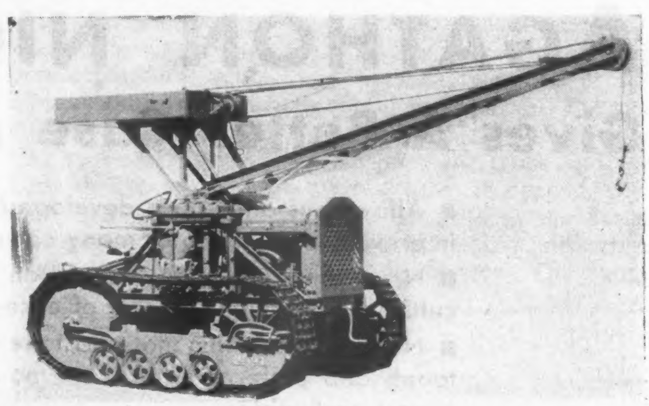
refinements and improvements over old types. The beam is a steel rod, stiff enough to prevent the bending which often causes inaccuracy in wood-beam trammels. The beam is flattened on top so that the trams, once clamped in position, have no tendency to turn when pressure is applied to the points. As the illustration shows, one of the trams has an adjusting screw which permits fine adjustments. The setting of the points is made easy by the arrangement of a spring friction which holds the tram in place when the nuts are loosened.

An improvement which makes the trammels more accurate and at the same time makes them easier to use is the design of the knurled grips. These are in the form of rollers which turn freely with the fingers as the arc is scribed.

The trammed points are adjustable in the spring chucks. They can be replaced by pencils, caliper legs or ball points. The ball points permit working from holes up to 1½ in. in diameter. The trammel is supplied with steel beams of various lengths to scribe circles of 18 in., 26 in. and 36 in. in diameter. In addition, an extra 20-in. beam with a rigid coupling is obtainable, increasing the range of the tool to circles 72 in. in diameter.

Tractor-Mounted Roustabout Crane

THE Hughes-Keenan Roustabout Crane*, which is manufactured by the Hughes-Keenan Company, Mansfield, Ohio, has been adapted to the Model GU Trackson Allis-Chalmers crawler tractor. This combination is designed to provide a compact, flexible and



The Hughes-Keenan Roustabout crane mounted on a model GU Allis-Chalmers crawler tractor

easily operated crane unit that meets the needs of railroad shops and yards for spotting, lifting and transporting heavy or unwieldy weights such as wheels and other car parts, rail sections, large boxes, bales, and other freight, etc.

Both the crawler tractor and the crane are constructed and designed for heavy duty. The Model GU Trackson Crawler is of open design with wide clearances. The boom of the Hughes-Keenan Crane is full-revolving, swinging in all directions through a complete circle, on a ball-bearing turntable, and is effective at all points because of the counterweight box which is mounted on the turntable. The boom can be raised and

* The Hughes-Keenan Roustabout Crane mounted on a truck for general shop use was fully described on page 230 of the May, 1930, issue of the *Railway Mechanical Engineer*.

(Continued on next left-hand page)

INTENSIFIED POWER PRODUCTION

. . . Cuts Locomotive Maintenance

■ Locomotive maintenance has been shown to be proportional to the number of cylinders and drivers.

■ So when the Lima-built 2-10-4 type locomotives of the Chesapeake and Ohio Railway replaced Mallets, a substantial maintenance saving was accomplished, as well as an improvement in operation.

■ The 2-10-4's have only two cylinders and five pairs of driving wheels to be maintained as compared with four cylinders and eight pairs of driving wheels on the Mallets.

LIMA
LOCOMOTIVE WORKS
INCORPORATED

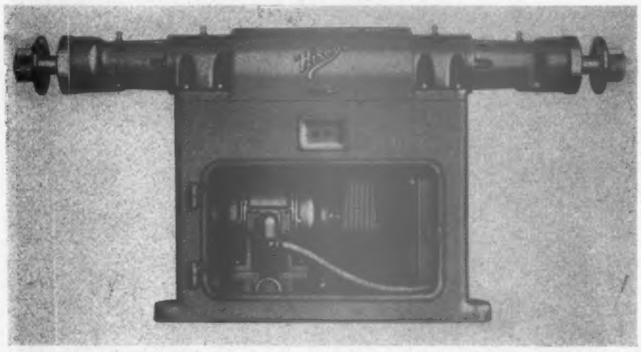
LIMA LOCOMOTIVE WORKS
INCORPORATED
LIMA - - - - - - - - - - OHIO

lowered by power, enabling the unit to go through doorways, etc., and the load can also be lifted or lowered without moving the boom. The load is raised by a cable which is wrapped on a drum and which is independent of the cables that hold the boom in place.

The crane does not interfere with the use of the tractor for drawbar operations, therefore making the outfit an all-purpose power unit, which can be used for hauling, skidding, etc., as well as for crane work.

Hisey Buffing and Polishing Machine

A RECENT addition to the grinding machines marketed by the Hisey-Wolf Machine Company, Cincinnati, Ohio, is the heavy-duty Texdrive buffing and polishing machine shown in the illustration. The grinder has an overall spindle length of 82 in., projecting 15 in. at each end. It weighs 2,600 lb., and is furnished with either a 10-hp. or 15-hp. motor, as desired.



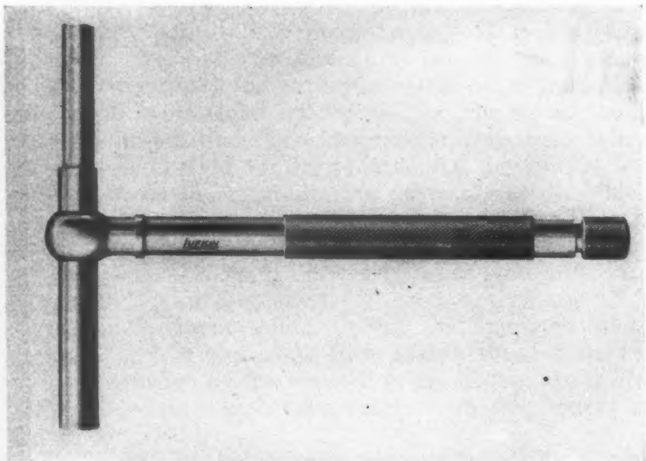
The Hisey 10-hp. to 15-hp. Texdrive grinding machine

The motor of this machine is equipped with ball-bearings and mounted horizontally on a dovetailed sliding base. A belt tension and alinement of the motor is effected by hand-wheel and feed-screw adjustment. The spindle head is mounted on four ball bearings, Timken roller bearings being optional. The bearing boxes are keyed to the column of the machine, the key running along the entire base of the bearing housing to insure alinement. The wheel-arbor ends are finished with flat-top threads to afford greater security in holding the buffing wheel. They are also fitted with a Tobin bronze safety wheel nut to protect the thread and the operator.

Lufkin No. 79 Telescoping Gages

A TOOL for gaging the inside diameter of holes or slots which consists of two telescoping plungers attached to a handle which always locates itself in the center of the plungers, is a recent addition to the line of products marketed by the Lufkin Rule Company, Saginaw, Mich. The telescoping plungers can be locked by a slight turn of a knurled screw in the end of the handle of the gage which, by virtue of its central position on the plunger, permits the perfect balancing of the tool.

The ends of the plungers are hardened and ground to a radius in order to furnish clearance for the gage when it is inserted in the smallest hole it will enter. The tools are designated as the Lufkin No. 79 gages and are made in five sizes, ranging from the smallest which is designed for use in holes of ½-in. to ¾-in. diameter to the largest which can be used in holes from 3½-in. to 6-in. in diameter.



The Lufkin No. 79 telescoping gage

To obtain a measurement, the plungers are compressed and locked after which the gage is inserted in the hole or slot. When the lock is released, the plungers expand to the exact size of the hole or slot. They are locked in that position and the gage is removed. The size of the hole is then measured by the use of an outside micrometer.

Buffalo Heavy-Duty Production Drill

THE 10-in. heavy-duty production drill shown in the illustration is the product of the Buffalo Forge Company, Buffalo, N. Y. It is constructed with a

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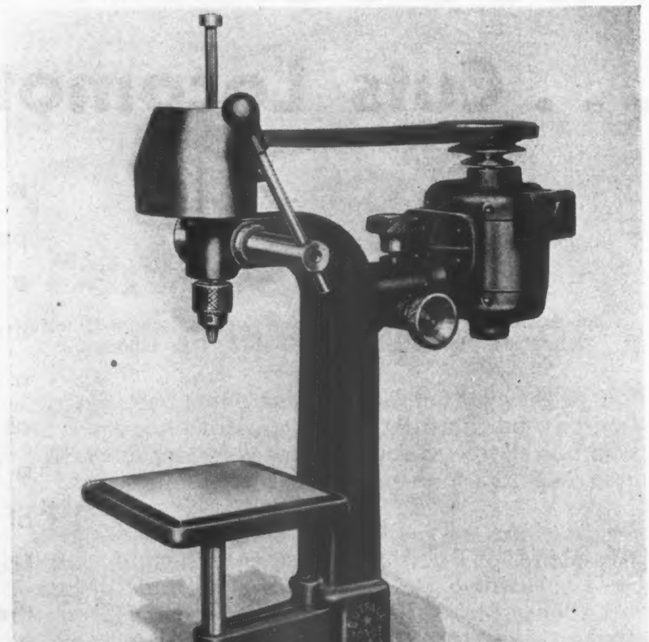
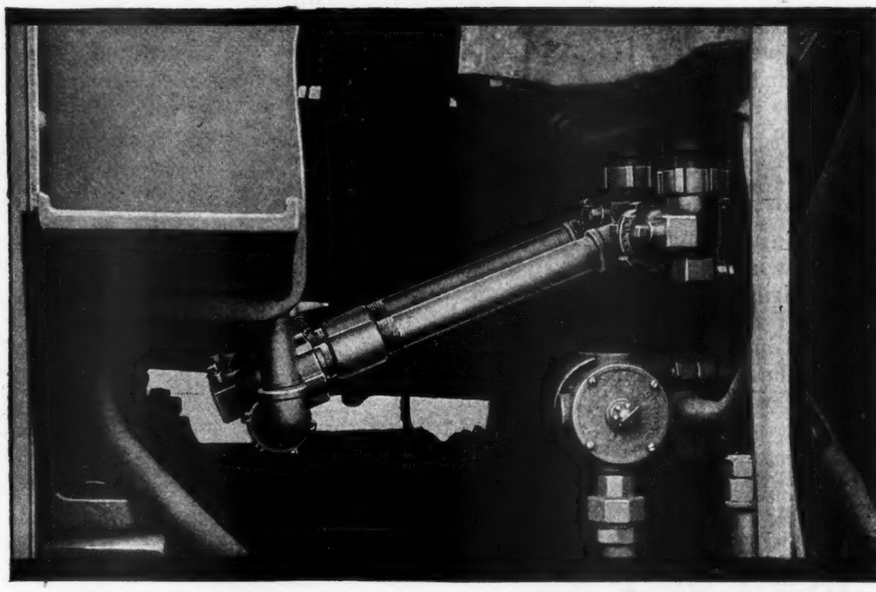


The Buffalo 10-in. heavy-duty drill



Save Gaskets...Lower Maintenance

...with the Franklin Sleeve Joint

HERE is an improved flexible connection free from limitations for conveying air, steam and oil between engine and tender.

■ It offers two outstanding features—flat gaskets and wide spread bearings supporting the sleeve—which assure longer life and correspondingly lower maintenance costs.

■ Due to the wide spacing of the sleeve bearings, the sleeve and gasket always maintain true alignment. There is no tendency to "cock". Bearing wear is greatly reduced... gasket life is prolonged.

■ Uniform wear is assured when flat gaskets are used. Little area is exposed to line pressure and foreign matter is easily kept out of the joint, reducing abrasive action and undue gasket wear.

■ In any flexible connection the gasket is the important maintenance item. By using Franklin Sleeve Joints with their flat gaskets not only is maintenance reduced, but when gaskets are renewed, the first cost of the flat type is far lower.

■ Franklin Sleeve Joints are not affected by curve distortion.

FRANKLIN RAILWAY SUPPLY COMPANY, Inc.

NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO MONTREAL

heavy box-column frame and bronze bearings throughout and is designed to fit the requirements of a large-range bench drill capable of production work.

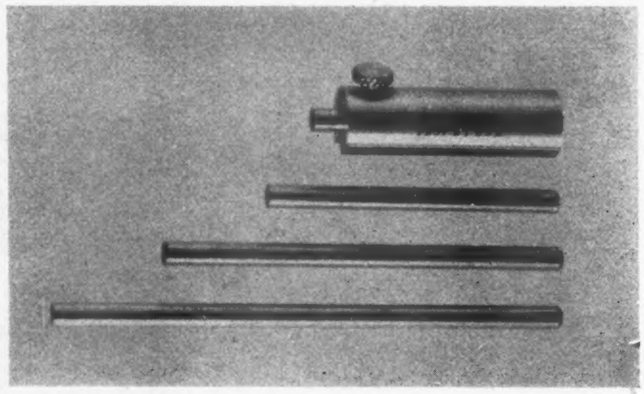
The drill has a ½-in. capacity in cast iron and is designed to operate at spindle speeds of 3,000, 1,750 and 850 r.p.m. A vertical ball-bearing ¼-hp. motor, operating at 1,725 r.p.m., is mounted on the back of the box column frame. The spindle is fitted with a quick return spring and hand knobs are furnished for rack and pinion adjustment of the belt. The table has a 7-in. square working surface, designed with an oil trough.

The drill is 32-in. high and the distance from the center of the column to the center of the drill measures 5⅛-in. The spindle travel of the drill is 3½-in., the maximum distance from the chuck to the table is 11½-in., while the vertical movement of the table is 10 in. Complete with the motor, the drill weighs 105 lb.

Brown & Sharpe Depth Gage

IN the illustration is shown a recently developed depth gage designated as the No. 599 gage by its manufacturers, the Brown & Sharpe Manufacturing Company of Providence, R. I. It is designed for checking the depth of holes, counterbores and distances between shoulders and flanges, having the advantage that it may be used against or between very small shoulders or in shallow recesses.

Depths from 0 in. to 2 in. by thousandths of an inch are obtained by measuring the overall length of the body and rod with a micrometer. From this measurement is subtracted the length of the body which is exactly 1 in. The rods are polished and the body is hardened and ground, and has a V-groove which facilitates measuring against a curved surface. When a measurement is taken, the setting is locked by the clamp screw.



The Brown & Sharpe No. 599 depth gage

If desired, the tool can be used to measure distances from 1 in. to 3 in. between shoulders, etc. and, where the tool is used for this purpose, the micrometer reading of the overall length is the correct dimension.

Ten Years Ago.—Car and locomotive prices reached a peak in 1920. Prices paid for locomotives in that year were two and one-half times the average prices for the years 1910-1914; for all-steel freight cars, three times; for freight cars of composite construction more than three times, and for passenger coaches more than twice.—Railway Age, January 7, 1921.

(Continued on next left-hand page)

* * *

A 250-ton planer, built by the G. A. Gray Company, Cincinnati, Ohio, which is equipped with a 60-ton table capable of accommodating work 10 ft. high and 30 ft. long

Among the

Clubs and Associations

Car Foreman's Association of Omaha, Council Bluffs and South Omaha Interchange.—On March 12 at 2 p.m. E. R. Phillips, general foreman of the Chicago & North Western, Council Bluffs, Iowa, will present before the Car Foreman's Association of Omaha, Council Bluffs and South Omaha Interchange a paper on standard markings on wheels removed at all shops to facilitate checking of wheels by A.R.A. inspectors. This will be followed by a discussion of brake rigging on freight cars.

Mechanical Division, A. R. A.—The twelfth annual meeting of the American Railway Association Mechanical division is scheduled to be held June 23, 24 and 25 at the Congress hotel, Chicago. This will be a business session with the proceedings largely limited to the reports of important standing committees. Other committees will present reports in case they have recommendations with an important bearing on economy and efficient operation. Plans are being made for one or two well-known railway executives to address the division. Railway supply men interested in the reports or the discussion will be welcome, but no entertainment features are scheduled and there will be no exhibition of equipment or supplies in connection with the convention.

Pacific Railway Club.—S. T. Bledsoe, chairman of the Executive Committee of the Atchison, Topeka & Santa Fe, will be the guest of honor and principal speaker at the fourteenth annual meeting and banquet of the Pacific Railway Club which will be held on March 19 at the Fairmont Hotel, San Francisco, Cal. Brief addresses will also be delivered by Paul Shoup, president, Southern Pacific; H. M. Adams, president, Western Pacific; Edward H. Maggard, president, Northwestern Pacific; H. A. Mitchell, president, Sacramento Northern Railway Company; A. J. Lundberg, president, Railway Properties & Equipment Corporation, and Samuel Kahn, president, Market Street Railway Company. J. P. Potter, vice-president of the Key System, Ltd., and retiring president of the club, will be toastmaster, and entertainment will be furnished by the Southern Pacific concert orchestra. Officers for the coming year will be installed at this meeting.

Club Papers

Railroad-Shop Welding Practice

American Welding Society, New York Section.—Meeting held at the Engineering Societies Building, 29 West 39th Street, New York, Tuesday, February 24. Papers by E. V. David, Applied Engineering Department, Air Reduction Sales Company, and by George L. Young, boiler foreman, The Reading Company, Reading, Pa. ¶ Lengthening tender underframes with the oxyacetylene torch, the paper presented by Mr. David, appears in the Back Shop and Enginehouse section of this issue of the *Railway Mechanical Engineer.* ¶ The paper by Mr. Young reviewed the early application of welding in the railway field and discussed at length oxyacetylene and electric welding as practiced today by the Reading Company in its shops at Reading, Pa. ¶ In discussing welding applications to locomotive repairs, Mr. Young described the rebuilding of two Santa Fe type locomotives at the Reading shops. These locomotives were rebuilt from Mallet type locomotives and were ready for service in their rebuilt form seven weeks after the Mallets had been placed in the shop. ¶ It developed that these locomotives have two interesting features based on the welding art. The first of these are the tenders, which have a water capacity of 19,000 gal. and space for 26 tons of coal and which are completely electric welded. These tenders are equipped with Commonwealth underframes and six-wheel trucks. ¶ The other welding feature of these locomotives is the construction of the firebox which is entirely welded except that rivets are used in attaching the mud rings to the inside and outside sheets. The firebox and combustion chamber combined are 190¼ in. long, the firebox consisting of four sheets, the firebox sheet, door sheet, throat sheet and back flue sheet. The firebox sheet is made of ⅜-in. stock and is 185 in. wide by 230 in. long. The door sheet, throat sheet and back flue sheet are welded to the crown and side sheets. The seam of the combustion chamber is welded through the bottom of that chamber. ¶ In addition, there are three Nicholson Thermic syphons welded in place, two in the firebox and one in the combustion chamber. At the upper end they are welded to the crown sheet. The lower end of the combustion chamber syphon is welded to a diaphragm which is set in and welded to the bottom of the combustion chamber. The lower ends of the firebox syphons are welded into openings in the throat sheet. There is a total of 120 ft. 6¼ in. of welded seams in the construction of each boiler of these two Santa Fe type locomotives. This does not include the welding of the flues. ¶ In addition to these two important features of Mr. Young's paper, he discussed at length the training of welders, the use of young men for this purpose and the care which should be exercised in guarding the welders and men working adjacent to the electric arc.

Help Yourself by Helping the Railroads

St. Louis Railway Club.—Meeting held December 12 at St. Louis, Mo. Address by Col. F. W. Green, vice-president, St. Louis Southwestern, on "The Business Outlook." ¶ As an interesting sidelight on the present business depression and indicating that the problems now facing practically all industries, including the railroads, may be acute, but not new, Colonel Green called attention to the historical fact that in 1821 Governor Bates of Missouri deprecated legislation enacted by the Missouri legislature to relieve the acute depression caused by over-expansion in the east and ill-advised land speculation in the west. Colonel Green outlined some of the conditions which must be squarely faced by the railroads if they are to continue giving satisfactory service to the American public and earn a reasonable return on their investments. ¶ His address was concluded with the following highly pertinent paragraph: "Railroads work on a very narrow margin between income and outgo. Believe it or not, the welfare of the public is intimately related to the welfare of the railroads. It has been shown that over a long period of years, the curve of general prosperity and the curve of railroad prosperity run parallel. When railroads stop buying, prosperity wanes, and conversely. The reason for this is that the railroads rank at or near the top as consumers of bituminous coal, fuel oil, iron and steel, brass castings, lumber, cement, paints and varnishes, and so on. Prices fluctuate with demand. When the railroad demand stops, prices slump. If you want to help yourself, help the railroads, and if you want to help the railroads to do their part about bringing about a return of prosperity, may I suggest that you do two things: (1) Decline to permit yourself to be misled by fantastic economic theories, such as increasing wages to increase purchasing power, and (2) that you let your congressmen and senators know that you are interested in their helping to bring about return of prosperity and that, in your opinion, a quick way of bringing it about would be to permit transcontinental carriers to compete with ocean carriers operating through the Panama canal without reduction of rates to all intermediate points to the basis of the ocean terminal rates."

High-Test Alloy Cast Iron

Western Metal Congress, American Society for Steel Treating—Meeting held in San Francisco, February 16. Paper by Frank B. Coyle, Research Metallurgist, The International Nickel Company, Inc.,

(*Continued on next left-hand page*)

New York City. ¶Preventives have been developed in metallurgy to keep metals strong and healthy, just as in medicine to protect man. A "hypodermic" injection of nickel in molten gray cast iron prevents the metal from developing a weak structure. ¶"In all grades of gray cast iron," Mr. Coyle explained, "some free carbon is present in the form of graphite. These large graphite flakes, producing planes of weakness in the metal, are responsible for the relative weakness of gray cast iron. The weakening effect is reduced to a minimum by lowering the carbon content as much as practicable and injecting alloying elements—nickel, or nickel with chromium—to break up the existing flakes and to scatter the minute graphite particles throughout the metal. By this combination of effects, a strength nearly double that of ordinary cast iron is attained." ¶Mr. Coyle stated that it is generally considered that cast iron can be divided into four major groups, the basis of sub-division being its tensile strength. These sub-divisions and their range of tensile strengths are: common gray cast iron, under 30,000 lb. per sq. in; high-grade cast iron, 30,000 to 38,000 lb. per sq. in.; high-test cast iron, 38,000 to 50,000 lb. per sq. in.; high-strength cast iron over 50,000 lb. per sq. in. ¶Mr. Coyle limited his paper to the discussion of the production of high-test cast iron and its alloys with nickel and nickel with chromium. This type of gray iron, he pointed out, can be produced in any foundry if reasonable care and watchfulness are observed. He then discussed the necessary procedure to be followed for the production of this type of cast iron. ¶Mr. Coyle referred in the latter part of his paper to alloy additions to cast iron, stating that "it has been found that alloys, particularly nickel, or nickel and chromium, produce maximum quality in high-test cast iron." This product with a carbon range of 2.7 per cent to 3.15 per cent can be produced, he stated, with a tensile strength of 38,000 to 49,000 lb. per sq. in.; a transverse strength of 4,200 lb. to 5,600 lb. per sq. in.; a Brinell hardness of 200 to 240 and a deflection of .15 to .20 in. Referring to the use of high-test cast iron alloyed with nickel, as compared with regular cylinder iron for use in locomotive cylinder castings, Mr. Coyle stated that the alloy high-test iron with a nickel content of 1 per cent. to 1.25 per cent has a tensile strength of 37,500 to 46,100 lb. per sq. in., as compared with 26,000 to 32,000 lb. per sq. in. for the regular cylinder iron. The regular cylinder iron has 2,200 to 3,000 lb. per sq. in. transverse strength, 160 to 170 Brinell hardness and a deflection of .17 to .18 in. ¶Mr. Coyle said that high-test gray iron in the 38,000 lb. to 50,000 lb. per sq. in. range of tensile strength is particularly applicable to medium and heavy castings where the combination of strength and resistance to wear are essential. Applications for the high-test alloy cast iron, he said, includes the following: locomotive cylinders, bushings, pistons and rings; machine-tool beds and tables; valve bodies, hydraulic-press plungers, hammer frames, gears, brake drums, pumps, and Diesel engine parts.

Directory

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal building, New York.

AMERICAN RAILWAY ASSOCIATION.—DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago. Meeting June 23, 24 and 25, Congress Hotel, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I. — SAFETY SECTION. — J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—Paul D. Mallay, chief engineer, transportation department, Johns-Manville Corporation, 292 Madison avenue, New York. Spring meeting April 20-23, Birmingham, Ala.

MACHINE SHOP PRACTICE DIVISION. — Carlos de Zafra, care of A. S. M. E., 29 West Thirty-ninth street, New York.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey- Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—L. H. Morrison, associate editor, Power, 475 Tenth avenue, New York.

FUELS DIVISION.—A. D. Black, associate editor, Power, 475 Tenth avenue, New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

ASSOCIATION OF RAILWAY SUPPLY MEN.—J. W. Fogg, MacLean-Fogg Lock Nut Company, 2649 N. Kildar avenue, Chicago. Meets with International Railway General Foremen's Association.

BOILER MAKER'S SUPPLY MEN'S ASSOCIATION.—Frank C. Hasse, Oxweld Railroad Service Company, 230 N. Michigan avenue, Chicago. Meets with Master Boiler Makers' Assoc.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 3001 West Thirty-ninth Place, Chicago, Ill. Regular meeting, second Monday in each month, except June, July and August, Great Northern Hotel, Chicago, Ill.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 608 South Main street, Los Angeles, Cal. Meetings second Monday of each month except July, August and September, in the Pacific Electric Club building, Los Angeles, Cal.

CAR FOREMAN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth streets, Council Bluffs, Iowa. Regular meetings, second Thursday of each month at Council Bluffs.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—F. G. Weigman, 720 North Twenty-third street, East St. Louis, Ill. Regular meeting first Tuesday in each month, except July and August, at American Hotel Annex, St. Louis, Mo.

CENTRAL RAILWAY CLUB OF BUFFALO.—T. J. O'Donnell, executive secretary, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 453 East Sixth street, Cincinnati. Regular meeting second Tuesday, February, May, September and November.

CLEVELAND RAILWAY CLUB.—F. L. Frericks, 14416 Adler avenue, Cleveland, Ohio. Meeting second Monday each month, except July, August and September, at the Auditorium, Brotherhood of Railroad Trainmen's building, West Ninth and Superior avenue, Cleveland.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—E. A. Jackson, Box 22, Mail Room, Union Station, Indianapolis, Ind. Regular meetings first Monday of each month at Hotel Severin, Indianapolis, at 7 p.m. Noon-day luncheon 12:15 p.m. for Executive Committee and men interested car department.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S SUPPLY MEN'S ASSOCIATION.—J. H. Jones, Crucible Steel Company, of America, 650 Washington boulevard, Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash street, Winona, Minn.

INTERNATIONAL RAILWAY SUPPLY MEN'S ASSOCIATION.—W. J. Dickinson, acting secretary, 1703 Fisher building, Chicago. Meets with International Railway Fuel Association.

LOUISIANA CAR DEPARTMENT ASSOCIATION.—L. Brownlee, 3730 South Prieur street, New Orleans, La. Meetings third Thursday.

MASTER BOILERMAKER'S ASSOCIATION. — A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—See Car Department Officers Association.

NATIONAL SAFETY COUNCIL—STEAM RAILROAD SECTION: W. A. Booth, Canadian National, Montreal, Que. William Penn and Fort Pitt Hotels, Pittsburgh, Pa.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September. Copley-Plaza Hotel, Boston.

NEW YORK RAILROAD CLUB.—Douglas I. McKay, executive secretary, 26 Cortlandt street, New York. Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

PUEBLO CAR MEN'S ASSOCIATION.—I. F. Wharton, chief clerk, Interchange Bureau, Pueblo, Colo.

RAILWAY BUSINESS ASSOCIATION. — Frank W. Noxon, 1124 Woodward building, Washington, D. C.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, chief clerk, Peoria & Pekin Union Railway, 217 Lydia avenue, Peoria, Ill.

RAILWAY CLUB OF GREENVILLE.—Paul A. Minnis, Bessemer & Lake Erie, Greenville, Pa. Meetings third Tuesday of each month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Regular Meeting fourth Thursday in month, except June, July and August. Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY EQUIPMENT MANUFACTURERS' ASSOCIATION.—F. W. Venton, Crane Company, 836 South Michigan avenue, Chicago. Meets with Traveling Engineers' Association.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, M. P. O. Drawer 24, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, June, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION. — E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division, American Railway Association.

SUPPLY MEN'S ASSOCIATION.—Bradley S. Johnson, W. H. Miner, Inc., Chicago. Meets with Car Department Officers Association.

TRAVELING ENGINEERS' ASSOCIATION. — W. O. Thompson, 1177 East Ninety-eighth street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—W. J. Dickinson, 343 South Dearborn street, Chicago. Regular meetings, third Monday in each month.

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NEWS

Bethlehem Pours a 230-Ton Steel Casting

IT IS REPORTED THAT the largest steel casting ever poured has been produced in the Lehigh plant of the Bethlehem Steel Company at Bethlehem, Pa. The casting is a platen, or cylinder jacket, for the 14,000-ton forging press at the Bethlehem plant and has a height of 12 ft. 10 in., a length of 23 ft. 4 in., and width of 10 ft. 2 in. It weighs 460,000 lb. Six open-hearth furnaces were required to melt the steel. In pouring, the mold was filled in approximately 10 min. and the total time, including the filling of the sink-heads during the cooling of the metal in the mold, required 38 min. The casting was allowed to cool in the mold ten days before cleaning was attempted.

Cloverport Protests Loss of Shops

THE LOUISVILLE, HENDERSON & ST. LOUIS and the Louisville & Nashville, which acquired the former in 1930, have filed a suit in the federal district court at Louisville, Ky., to restrain the City of Cloverport (Ky.) from forcing the railroad to maintain shops in that city. The city alleges that in April, 1894, it paid the Louisville, Henderson & St. Louis $20,000, in return for which the railroad agreed to maintain shops there permanently. The city not only asks for the return of the $20,000, but seeks $30,000 in interest. Plans for the consolidation of the facilities of the two roads contemplate the abandonment of mechanical facilities at Cloverport and the railroad holds that their retention would be a hindrance to interstate commerce.

Equipment Installed

NEW FREIGHT CARS installed in service by the railroads in 1930 totaled 76,909, according to reports compiled by the Car Service Division of the American Railway Association. This was a reduction of 7,985 cars under the number placed in service in 1929, but an increase of 18,514 cars above 1928 and 1,523 cars above 1927. Box cars totaled 40,042; coal cars 27,911; refrigerator cars, 3,974; flat cars, 3,668; stock cars, 913, and miscellaneous cars, 401. The railroads in 1930 also installed 782 new locomotives, compared with 762 in 1929; 1,390 in 1928, and 1,955 in 1927.

New freight cars on order on January 1, 1931, totaled 9,821, of which box cars totaled 4,357; coal cars, 3,278; refrigerator cars, 1,543; stock cars, 500, and flat cars, 143. On January 1, 1930, the railroads had 34,581 new freight cars on order, and on January 1, 1929, there were 13,036 on order. New locomotives on order January 1, 1931, totaled 120 compared with 431 on January 1, 1930, and 147 on January 1, 1929.

Research Graduate Assistantships

NOMINATIONS to the fourteen research graduate assistantships at the Engineering Experiment Station, University of Illinois, Urbana, Ill., will be made this year as usual from applications received by the director of the station not later than April 1. These assistantships, for each of which there is an annual stipend of $600 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry. An appointment to the position of research graduate assistant is made and must be accepted for two consecutive collegiate years of ten months each, at the expiration of which period, if all requirements have been met, the degree of Master of Science is conferred. Additional information concerning these assistantships may be obtained by writing the director of the station at Urbana.

Combination Rail-Highway Vehicle Developed in Britain

A COMBINATION motor vehicle interchangeable for operation on either rails or highways has recently been developed in Great Britain. The vehicle, designated "Ro-Railer" and manufactured by Karrier Motors, Ltd., was recently tested on a branch line of the London, Midland & Scottish. These tests were conducted with a vehicle having a motor coach body. In the accompanying illustration, it will be seen, the vehicle is fitted with a tractor body; thus the "Ro-Railer" is designed for both passenger and freight service on light traffic branch lines.

The vehicle is so constructed that the change from rail to highway operation or vice versa may be effected at any level crossing. Only two or three minutes are required for this change. When the vehicle is on the highway the flanged wheels are locked concentrically to the road wheels but, being of small diameter, these rail wheels are clear of the road wheels and of the rail when the vehicle runs onto the crossing for a change from highway to rail operation. As the vehicle leaves the highway to proceed by rail its weight is transferred from the highway wheels to the rail wheels as the former leave that portion of the railway which has been built up to the level of the highway.

The highway wheels are so fitted that the driver by the turn of a lever may raise them clear of the rail level and lock them to the chassis. Thus, when the "Ro-Railer" is operating on rails, only the flanged wheels revolve while the highway wheels remain locked in position. For a return to the highway the operation is reversed.

Sir Charles Parsons Inventor of Steam Turbine Dies

THE DEATH of the Honorable Sir Charles Parsons, the inventor of the well-known Parson's turbine, on February 11 at the age of 76 will be of interest to many readers of the *Railway Mechanical Engineer*. Sir Charles, who was made a Knight Commander of the Bath in 1911, was the first British engineer to receive the Order of Merit which was awarded in June, 1927. He held honorary degrees from various universities and was awarded the Rumford and Copley medals by the Royal Society; the Albert medal, Royal Society of Arts; the Faraday medal, Institution of Electrical Engineers, and the Kelvin medal.

Sir Charles was best known in this country as the inventor and developer of

The "Ro-Railer" with tractor body

the steam turbine in connection with the generation of electricity and ship propulsion. In addition to this work, he conducted many researches and experiments, especially pertaining to the effect of high pressures and temperatures on chemical action and the physical condition of materials. In addition to his many engineering activities, he served on a number of committees in England during the war and was an original member of the Advisory Council of the Department of Scientific and Industrial Research.

Hose-Coupling Screw Threads —Proposed Standard

THE PROPOSED AMERICAN STANDARD for hose-coupling-screw threads for all connections having nominal inside diameters of ½, ⅝, ¾, 1, 1¼, 1½ and 2 inches has been released for general criticism and comment. This proposal includes the form and pitch of the thread in addition to dimensional tables for hose couplings for steam, water and air services (fine threads); and hose couplings for certain other applications (coarse threads).

This proposed standard has been developed by the Sectional Committee on the Standardization of Screw Threads for Hose Couplings for which The American Society of Mechanical Engineers is the sponsor body. This committee, organized under the procedure of the American Standards Association, consists of 26 members representing 20 national organizations. The proposed standard is in tentative form for discussion and suggestions will be welcomed. They should be addressed to C. B. LePage, Assistant Secretary, The A.S.M.E., New York.

Thirteen Million Man-Hours

FOUR SHOPS of the Southern have been run for 4,681 shop days without a reportable casualty, which, says Lew R. Palmer, who reports the figures for the National Safety Council, is an all-American railroad shop record. The shops are those at Birmingham, Ala. (Finley shop), Selma, Ala., Hayne, S. C., and Lawrenceville, Va. The last casualty recorded at Lawrenceville was on August 21, 1926; at Hayne, June 25, 1927; at Selma, February 4, 1928, and at Finley shop, December 19, 1928. The total number of man-hours worked in the respective shops since those dates, up to January 1, 1931, has been 13,110,578.

Supply Trade Notes

THE CARNEGIE STEEL COMPANY has opened an office in the Atlas building, Columbus, Ohio.

H. W. ANDERSON has been elected assistant secretary of Whitman & Barnes, Inc., Detroit, Mich.

THE PRATT & WHITNEY COMPANY is now represented by the Smith, Booth, Usher Company at Los Angeles, Cal.

THE FROST RAILWAY SUPPLY COMPANY has moved its offices from the Penobscot building to the Union Guardian building, Detroit, Mich.

THE WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J., has moved its St. Louis district sales office to 1703 Ambassador building.

A. N. WILLSIE, of the Badeker Manufacturing Company, Chicago, has been elected president of that company, succeeding B. R. Alley, resigned.

THE TRUSCON STEEL COMPANY, Youngstown, Ohio, has moved its Minneapolis, Minn., offices from 611 Metropolitan Bank building to 344 Baker building.

THE CORLEY-DEWOLFE COMPANY, Elizabeth, N. J., has appointed the Great Lakes Supply Company, Chicago, its agent for railroads and industries in that district.

W. W. HANCOCK, formerly vice-president of the Donner Steel Company, has been appointed secretary of the Republic Steel Corporation, Youngstown, Ohio, to succeed Richard Jones, Jr.

G. H. WAITE, representative of the American Steel & Wire Co. with headquarters at Kansas City, Mo., has been promoted to manager of sales with the same headquarters.

R. M. CHESTER has been appointed general sales manager of the Neely Nut & Bolt Company. Mr. Chester's headquarters is in the general offices of the company at Pittsburgh, Pa.

C. B. MURPHY, special representative of the Diesel Engine division of Fairbanks Morse & Co. at Washington, D. C., has been appointed manager of stationary Diesel engines sales at Chicago.

J. C. KEENE, special representative, Bradford Corporation, has also been appointed manager of railway sales, mid-west district, Durametallic Corporation, with offices in the Pure Oil building, 35 E. Wacker drive, Chicago.

N. J. KAMEN, formerly of the Alemite Corporation, has been appointed a representative of the Edna Brass Manufacturing Company, Cincinnati, Ohio. Mr. Kamen's headquarters are at Chicago.

FRED S. WILCOXEN, formerly associated with the Edna Brass Manufacturing Company, Cincinnati, Ohio, has been elected vice-president of the Standard Locomotive Equipment Company, 1316 McCormick building, Chicago.

THE WEST ALLIS FUEL & SUPPLY COMPANY, West Allis, Wis., has been appointed distributors in Milwaukee and Waukesha counties, of the products of the General Refractories Company, Philadelphia, Pa.

W. NEWTON JEFFRESS, INC., railway specialties and supplies, has moved his headquarters from the National Press building, to the Woodward building Fifteenth and H streets, N. W., Washington, D. C.

ARTHUR W. BARTH, vice-president and secretary of Henry Giessel Company, Inc., Chicago, has been elected president to succeed Henry Giessel, deceased. D. R. Rader, assistant secretary, has been appointed secretary.

L. R. CONOLLY, sales engineer, of the MacLean-Fogg Lock Nut Company, Chicago, has been granted leave of absence to serve as representative of the department of Exhibits, Chicago World's Fair Centennial Celebration in 1933.

THE BETHLEHEM STEEL COMPANY has acquired the business and properties of the McClintic-Marshall Corporation. G. H. Blakeley, vice-president of the Bethlehem Steel Company, now becomes president of the McClintic-Marshall Corp.

CHESTER G. CUMMINGS, for a number of years associated with the New York office of the Sullivan Machinery Company, with headquarters at Syracuse, N. Y., has been appointed manager of the branch office in the Rockefeller building, Cleveland, Ohio, vice R. T. Stone, resigned.

THE AMERICAN HOIST & DERRICK COMPANY, St. Paul, Minn., the Dominion Bridge Company, Ltd., and the Dominion Engineering Works, Ltd., Montreal, Que., have formed the Dominion Hoist & Shovel Company, Ltd., a subsidiary company, to manufacture and sell the products of the former company in Canada and the British Empire.

S. H. TAYLOR, JR., has been placed in charge of the Pacific Coast office of the Lincoln Electric Company, with headquarters at Los Angeles, Cal., to succeed W. S. Stewart, who has been appointed district manager of the Cleveland territory.

(*Continued on second left-hand page*)

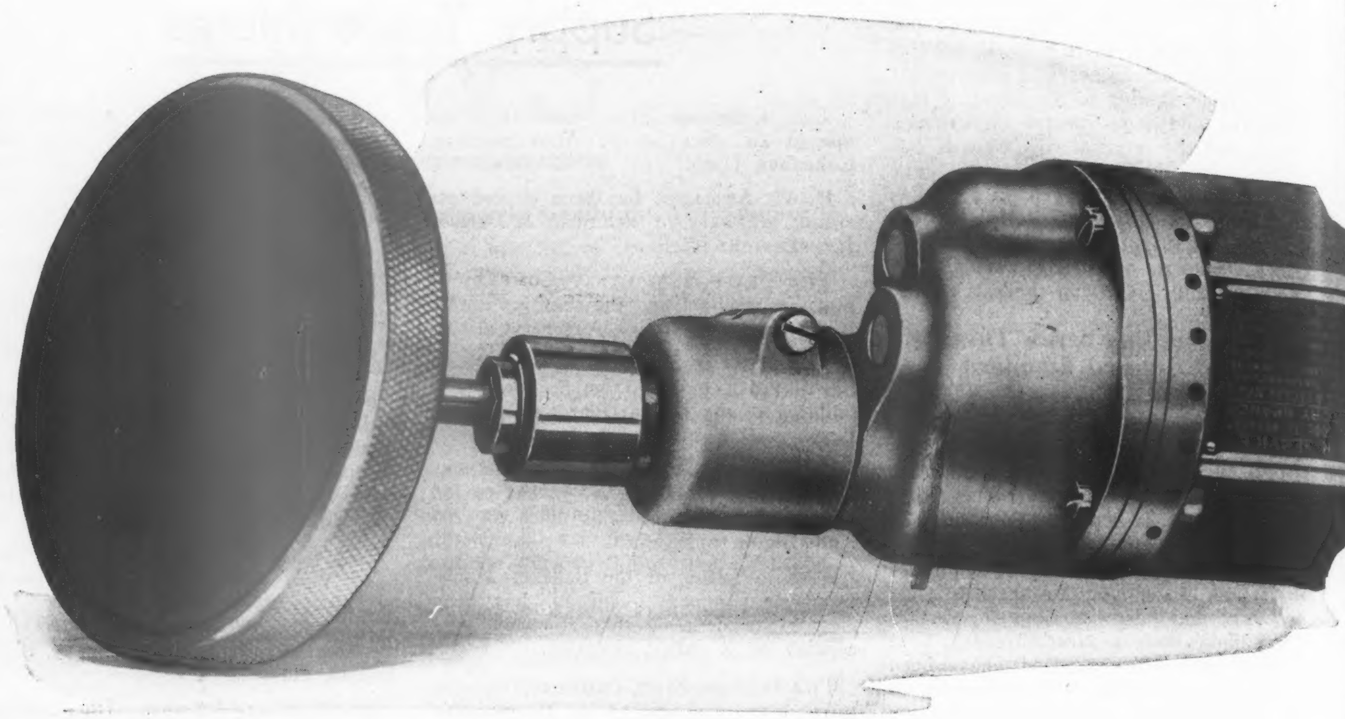
Domestic Orders Reported During January and February, 1931

Locomotives

Name of Company	Number ordered	Type	Builder
	January		
Inland Steel Co.	2	0-6-0	American Loco. Co.
	February		
Chicago & Illinois Midland	2	2-10-2	Lima Loco. Works
	1	2-8-2	Lima Loco. Works
Western Pacific	5	2-8-8-2	Baldwin Loco Works
Total for month	8		

Freight Cars

Name of Company	Number ordered	Type	Builder
The Inland Steel Co.	15	Ingot	Lorain Steel Co.
Byllesby Engineering & Management Corp.	2	Gondola	General American Car Co.
Freedom Oil Works Co.	7	Tank	Std. Tank Car Co.
Total for month	24		



ALCO DUCHESNE RUBBING HEAD

THE Duchesne Rubbing Head is the result of over two years effort by this company to perfect a method whereby costly hand rubbing could be eliminated.

After the adoption of this tool for our own use, the superior finish it gave attracted immediate attention and demands were made for it. We have since standardized all heads and parts to meet an ever increasing demand.

In its present form all heads are the same design. The various discs and rubbers meet every condition encountered on railway equipment which must be finished. The rubbing element is secured by a half turn sleeve nut permitting quick removal. The body is chucked, in an air or electric motor by a positive, but flexible drive which makes even contact of rubbing element at any angle it is held by operator.

There is a plain surfacing head for all flat or convex surfaces. It carries a load of six specially formed waterproof abrasive discs which are peeled off one by one as they wear out.

The depressed center surfacing head is for flat surfaces around rivets or similar obstructions, identical in design except for a depression in the center to clear a rivet head with the same discs except for a hole in the center to pass over rivet.

AMERICAN LOCO

30 CHURCH STREET

Roy E. Greenwood, formerly associated with the Simonds Saw & Steel Company, has been appointed assistant general manager of sales of the American Chain Company, Inc., and associate companies, Bridgeport, Conn. Mr. Greenwood will have his headquarters at Bridgeport.

William L. Brown, formerly Philadelphia district sales manager for the Industrial Works, Bay City, Mich., and its successor, Industrial Brownhoist Corporation, Cleveland, Ohio, has opened an office at 1600 Arch street, Philadelphia, Pa., to act as special agent for the sale of railroad specialties and cranes.

Howard G. Gass, vice-president of the St. Louis Car Company, has been elected a director to succeed George W. Scruggs, who has resigned as secretary and treasurer. Louis F. Gempp, assistant treasurer, has been promoted to the position of treasurer and Edward J. Plowden, assistant secretary, has been promoted to secretary. John F. Tringle has been appointed assistant treasurer.

Herbert A. May, who is identified with a number of local manufacturing concerns and banks in the Pittsburgh, Pa., district, has been appointed assistant to the president of the Westinghouse Electric & Manufacturing Company. Mr. May will have his headquarters in the Grant building, Pittsburgh, where the offices of the Westinghouse central sales district are located.

Jesse V. Honeycutt, who has been sales agent in New York City for frogs, switches and railroad material, has been appointed manager of sales of frogs and switches, of the Bethlehem Steel Company, with office at Bethlehem, Pa. He succeeds to the place of Neil E. Salsich, who has resigned to become vice-president in charge of sales of the Jeffrey Manufacturing Company, Columbus, Ohio.

W. A. McCallum has resigned as president and managing director of the Economy Railway Appliance Company, Ltd., and has been appointed president and managing director of the Reliance Railway Appliance Company, Ltd., 712 Railway Exchange building, Montreal, Canada. This company has the sole manufacturing and selling rights in Canada and the United States for the Economy tender water level indicator.

Augustus Wood, formerly chief engineer and works manager of the Niles Tool works, Hamilton, Ohio, has returned to its service in the capacity of consulting engineer. During his absence from Hamilton, he has held the positions of works manager at the Putnam Machine Company, Fitchburg, Mass., and consulting engineer for the parent company, Manning, Maxwell & Moore. More recently he has been connected as consulting engineer with the Consolidated Machine Tool Corporation, Rochester, N. Y.

Porter Hurd, Packard building, Philadelphia, Pa., has been appointed representative of the Illinois Testing Laboratories, Inc., Chicago. Mr. Hurd's territory includes eastern Pennsylvania, southern New Jersey, Delaware and Maryland. Ernest H. Du Vivier, 30 Church street, New York, represents the Laboratories in Metropolitan New York and northern New Jersey, and F. W. Fernald, 335 Fifth avenue, Pittsburgh, Pa., is in charge of the territory comprising western Pennsylvania and West Virginia.

J. A. Miller, general manager of sales of the Vanadium Corporation of America, has been appointed assistant to president, Pittsburgh district, with headquarters at Pittsburgh Pa. Gustav Laub, assistant general manager of sales, succeeds Mr. Miller as general manager of sales. Mr. Laub's headquarters are at New York.

Claus Greve, president of the Cleveland Pneumatic Tool Company, Cleveland, Ohio, has been elected chairman of the board; L. W. Greve, treasurer, has been elected president, and John DeMooy has been elected treasurer. L. W. Greve is also president of its associated companies, the Champion Machine & Forging Company and the Cleveland Rock Drill Company. H. W. Foster, vice-president, H. S. Covey, secretary, and Arthur Scott, superintendent of the Cleveland Pneumatic Tool Company, were re-elected and A. F. Barner was appointed assistant secretary.

R. C. Vilas, who has been associated with the Pyle-National Company, Chicago, since its incorporation in January, 1899, and who has been president since 1908, has been elected chairman of the board and has been succeeded by L. H. Vilas, his brother. William Miller, vice-president, has been elected senior vice-president, and J. A. Amos, vice-president, has been elected vice-president and general manager. Crawford P. McGinnis has been appointed district sales manager of the Pacific Coast territory of the Pyle-National Company, with headquarters in the Hobart building, San Francisco, Cal.

H. C. Beaver, formerly executive vice-president of the Rolls-Royce of America, has been appointed a vice-president of the Worthington Pump & Machinery Corporation, New York, and E. E. Yake has been appointed a vice-president. Mr. Beaver, who has been identified with the engineering, manufacture and sale of mechanical and electrical equipment for more than 30 years, will devote his time principally to the administration of the sales department of the Worthington Corporation. Mr. Yake will continue to direct the manufacturing and engineering divisions which were assigned to him in April, 1927.

The Westinghouse Electric & Manufacturing Company has formed a railway engineering department at Pittsburgh, Pa., by grouping its railway equipment and railway motor engineering departments, its railway engineering division of its general engineering department, its traction and mining division of its control engineering department, its overhead line material section of its supply engineering department, and its trolley design section of its gearing engineering department. Frederick Urban, assistant to the vice-president, has been placed in charge of the new department, and Francis E. Wynne, manager of the railway equipment engineering department, has been appointed assistant general manager. Claude Bethel, manager of the railway motor engineering division, has been appointed division engineer in charge of the equipment and control division; Sidney B. Cooper, manager of engineering in the general engineering department, has been appointed division engineer in charge of the project and motor division, Lynn G. Riley, assistant to the manager of the control engineering department, has been made assistant division engineer on control, and Lloyd J. Hibbard, special engineer in general sales, has been appointed special engineer.

Le Sauvage & Beardsley, Genesee building, Buffalo, N. Y., have been appointed direct representatives for Lo-Hed monorail electric hoists in the districts of Buffalo and Rochester by the manufacturers, the American Engineering Company, Philadelphia, Pa. Weed & Company will continue to distribute Lo-Heds in Buffalo and Rochester, co-operating with Le Sauvage & Beardsley.

R. B. McColl, who has been elected president and a director of the McIntosh & Seymour Corporation, Auburn, N. Y., as announced in the February issue of the *Railway Mechanical Engineer*, was born in 1882 at Kilmarnock, Scotland, where he attended the Kilmarnock Academy and the Science and Art College. After serving a special apprenticeship and working in various departments of the Glasgow & South-western, Mr. McColl was employed by Robert Stephenson & Sons, locomotive builders, Darlington, England, as a draftsman. In 1905 he went to the Montreal Locomotive Works, Montreal, Canada,

R. B. McColl

and served in several departments until he became assistant superintendent, then superintendent of works and finally works manager. In 1917 he was appointed manager of the munition department of the Eddystone Munition Company, where he served until after the armistice. Returning to England he was appointed general manager of the Armstrong-Whitworth

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Company's locomotive department in charge of the building and equipping of the locomotive works and of the sales, engineering and manufacturing of locomotives. Later, in addition, he was made general manager of the pneumatic tool department, gas and oil engine department and director of the Works board of all the company's plants which included shipbuilding and the construction of Diesel oil engines for marine work, etc. In January, 1922, Mr. McColl became attached to the New York office of the American Locomotive Company and the following June was appointed assistant manager of the Schenectady plant. In January, 1925, he was appointed manager of the plant, which position he held at the time of his election as president of the McIntosh & Seymour Corporation.

John S. Stevenson, who has been appointed manager of the Dunkirk (N. Y.) plant of the American Locomotive Company, began work in 1891 as an apprentice in the shops of the Peninsular Car Company. He first served for five years in the templet shops and then for four years learning car building. Mr. Stevenson was then transferred to the engineering department of a new company formed by the consolidation of the Peninsular Car Company with the Michigan Car Company. In 1899 this company became a part of the American Car & Foundry Company and in 1901 he was transferred to the St. Louis mechanical department. He returned in 1902 to the Peninsular plant in the shop engineering department, which position he held until the latter part of the same year when he became employed by the Russell Wheel & Foundry Company in charge of its car work. Mr. Stevenson returned to the service of the American Car & Foundry Company in 1912 and was in entire charge of the shop engineering of the Detroit plant until the close of the war when he was appointed general superintendent of the same plant. In 1926, he was transferred to the New York office and until his appointment as manager of the Dunkirk plant of the American Locomotive Company, had been in charge of the general development work of the entire company.

R. P. Allison, who has been appointed manager of the Schenectady (N. Y.) plant of the American Locomotive Company, entered the service of that company as an apprentice in 1896. He subsequently served as journeyman, assistant foreman and foreman until 1904 when he was appointed machine shop foreman of the Montreal Locomotive Works, Montreal, Canada, retaining that position until 1908 when he was appointed plant engineer. In 1916, Mr. Allison entered the employ of the Poole Engineering Company, Baltimore, Md., as works manager, serving in that position until 1919, and then was appointed works manager for Hale & Kilbourne, Philadelphia, Pa. Two years later Mr. Allison was appointed general superintendent of the Richmond plant of the American Locomotive Company and in 1927 was promoted to manager of the same plant. In April, 1930, he was transferred as manager to the Dunkirk plant of the American Locomotive Company.

Obituary

Orton Lee Prime, president of the Prime Manufacturing Company, Milwaukee, Wis., who died at Rochester, Minn., on January 14, was born on April 3, 1874, at Fall River, Wis. Mr. Prime attended St. John's Military Academy at Delafield, Wis., and Michigan University,

Orton Lee Prime

at Ann Harbor, Mich. He served in the Spanish American War as a corporal in the second regiment Troop B, United States Cavalry. Early in 1900 Mr. Prime was president of the Prime Steel Company, Milwaukee, and in 1914 when the Prime Manufacturing Company was formed Mr. Prime continued as president.

Henry Giessel, president of the Henry Giessel Company, Chicago, died in Park Ridge, Ill., on January 27. Mr. Giessel was born on July 31, 1855 in Germany and came to the United States at the age of 12. After completing his education and serving his apprenticeship in the sheet metal trade he began the manufacture of various metal specialties, including acetylene gas machines. During 1892 he began the manufacture of water filters for use on railroad dining cars and in 1914 formed and became president of the Henry Giessel Company to manufacture sanitary drinking water coolers, filters and auxiliary appliances for use on all types of railroad passenger equipment.

W. H. Sauvage, vice-president of the Royal Railway Supply Company and president of the Sauvage Appliance Company, was shot and killed in his office at 90 West street, New York City, on February 5. According to the medical examiner's report on the case, Mr. Sauvage was shot by Andrew Lenahan, office manager of the same company, who was fatally wounded in his subsequent attempt at suicide. Mr. Lenahan died on his way to the hospital. Mr. Sauvage was well known in the railway supply business. He was born in February, 1872, at Pomeroy, Ohio, and was an engineer and an inventor of railway appliances. He had served as first sergeant from 1889 to 1892 in the Colorado National Guard. The greater part of Mr. Sauvage's business life had been connected with his own companies. He was the author of articles on power and hand brakes in technical papers and magazines.

Personal Mention

General

H. W. Reinhardt, master mechanic of the Missouri Pacific at North Little Rock, Ark., has been appointed assistant superintendent of motive power of the Chicago Great Western.

E. A. Shull, master mechanic of the Wichita Falls & Southern, has been appointed superintendent of motive power, with headquarters as before at Wichita Falls, Tex.

Master Mechanics and Road Foremen

E. R. Hanna has been appointed master mechanic of the Arkansas division of the Missouri Pacific, with headquarters at North Little Rock, Ark.

A. E. Bruning, road foreman of engines of the Chicago & Illinois Midland, has been appointed assistant master mechanic, with headquarters at Springfield, Ill.

H. M. Allan has been appointed district master mechanic of the British Columbia district of the Canadian Pacific, with headquarters at Vancouver, B. C.

G. T. Callender has been appointed master mechanic of the Central Kansas and Wichita divisions of the Missouri Pacific, with headquarters at Osawatomie, Kan.

C. T. Hunt, assistant master mechanic of the Pennsylvania at Wilmington, Del., has been transferred to the Pittsburgh division, with headquarters at Conemaugh, Pa.

George Schepp has been appointed master mechanic of the Joplin and White River divisions of the Missouri Pacific, with headquarters at Nevada, Mo.

J. S. Richards, master mechanic of the Pennsylvania at Mahoningtown (New Castle), Pa., has been transferred to the Buffalo division, with headquarters at Olean, N. Y.

W. R. Sorel, locomotive foreman of the Canadian Pacific at Calgary, Alta., has been promoted to the position of master mechanic of the Calgary division at the same point, succeeding H. M. Allan.

P. S. Lindsay, assistant superintendent of the Nelson division of the Canadian Pacific, has been appointed master mechanic of the Kootenay division, with headquarters as before at Nelson, B. C.

G. A. Rhoades, general foreman of the Buffalo division of the Pennsylvania at Oil City, Pa., has been appointed assistant master mechanic of the Akron division, with headquarters at Akron, Ohio.

W. O. Teufel, assistant master mechanic of the Pennsylvania at Altoona, Pa., has been appointed master mechanic of the Erie & Ashtabula division, with headquarters at Mohoningtown (New Castle), Pa.

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A. V. BIRCH, master mechanic of the Chicago Terminal division of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Schiller Park, Ill., has retired from active duty after 43 years of service on the Wisconsin Central and its successor, the Soo Line.

Car Department

PERCY O. HEWS has been appointed general car foreman of the Bangor & Aroostook, with headquarters at Bangor, Me.

VICTOR MANAN has been appointed master painter at the Waycross, Ga., shops of the Atlantic Coast Line. Mr. Manan was previously assistant paint shop foreman.

Purchasing and Stores

H. V. GARZA has been appointed purchasing agent of the National Railways of Mexico, with headquarters in Mexico, D. F.

WILLIAM F. NIEHAUS has been appointed assistant to the purchasing agent of the Missouri-Kansas-Texas, with headquarters at St. Louis, Mo.

H. W. HUGHES, chief clerk in the purchasing department of the Gulf, Colorado & Santa Fe at Clebourne, has been promoted to the position of division storekeeper with headquarters at Temple, Tex., succeeding C. J. Irwin.

F. E. CRAGIN, general storekeeper of the Los Angeles & Salt Lake, has been appointed district storekeeper with headquarters as before at Los Angeles, Cal. The position of general storekeeper at Los Angeles has been abolished.

Obituary

JOSEPH R. HAYNES, purchasing agent of the Chicago, Burlington & Quincy, at Chicago, died on February 20.

ROBERT L. DILLON, district storekeeper on the Missouri-Kansas-Texas at Sedalia, Mo., until his retirement in 1929, died recently at Denison, Tex.

HARRY C. STEVENS, general storekeeper of the Wabash and the Ann Arbor, died at Toledo, Ohio, on January 12. Mr. Stevens had been engaged in railway storekeeping service for 25 years.

GEORGE F. STEVENS, assistant engineer of the Boston & Maine, with headquarters at the Billerica (Mass.) shops, died suddenly at his home at Kingston, N. H., on January 30. Mr. Stevens was born on January 17, 1873, at Haverhill, Mass., and received his education at the local public schools. He commenced his railroad service with the B. & M. on November 18, 1895, as an apprentice draftsman in the motive power department. Between the period 1901 to 1903 he served as assistant to the master mechanic at the Boston shops and in the latter year became assistant to chief draftsman at Boston. In 1916, he was promoted to chief draftsman and in 1923 he became office engineer in the mechanical engineer's office. In 1927 he was advanced to the position of assistant engineer.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

TURBINES.—Complete data on the application and operation of turbines are contained in the latest bulletin of the Coppus Engineering Corporation, 344 Park avenue, Worcester, Mass. How to select the proper unit for each specific duty is also discussed.

PIPE BENDING.—The A. M. Byers Company, Clark building, Pittsburgh, Pa., in a bulletin, No. 50, setting forth the principles and practice of bending Byers Genuine wrought iron pipe, presents an interesting discussion of what happens in the pipe during the bending operation, hot or cold, and how successful results may be obtained.

METAL WORKING TOOLS AND MACHINERY.—A unique catalog of 158 pages of a convenient size for reference purposes has been issued by Joseph T. Ryerson & Son, Inc., Sixteenth and Rockwell streets, Chicago. Practically every type of tool and portable machinery for manufacturers, job shops and contractors in the metal working field is included in the catalogue, all supplies being omitted.

LUKENWELD CONSTRUCTION.—Lukenweld construction, a fabricated product for manufacturing units, such as housings, bases, beds, gear cases and other parts of machinery and equipment, is described in a bulletin issued by Lukenweld, Inc., a division of the Lukens Steel Company, Coatesville, Pa. By this method plates or slabs of Lukens Welding Quality rolled steel are gas cut to shape, formed if necessary, and then arc welded into the complete unit.

LATHES.—1930 new model Precision lathes for use in manufacturing plants, tool rooms, general repair shops, machine shops, etc., are illustrated and described in Hand Book No. 44 issued by the South Bend Lathe Works, 421 E. Madison street, South Bend, Ind.

ELECTROPLATING ALUMINUM.—"Electroplating Aluminum" is the title of a 36-page booklet issued by the Aluminum Company of America, Pittsburgh, Pa., describing the steps necessary for the cleaning and plating of aluminum both on smooth and roughened surfaces. Diagrams summarize the various procedures discussed.

STEWART MELTING POT.—"The Stewart Melting Pot" is a 30-page catalog covering annealing, normalizing, hardening of carbon and high-speed steels, carburizing, cyanide hardening, lead hardening, tool dressing, tempering and quenching. It has been issued by the Chicago Flexible Shaft Company, Chicago, for the man in the hardening room and for those interested in the heat treatment of metals.

OIL-ELECTRIC LOCOMOTIVES AND RAIL-CARS.—Special Publication 1880, a recent 60-page illustrated publication of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., contains a description of the applications, operation and construction of old-electric traction apparatus and photographs and diagrams of numerous locomotives and cars, many of which are now in service. It is composed of five sections—A general description of oil-electric locomotives and rail cars, selection of equipment, a general description of oil-electric-power plant, oil-electric rail car data, and oil-electric locomotive data. Comparative cost of operation figures are given, and curves showing certain length runs for certain grades are used to illustrate short-cut methods for picking out the right locomotive for the right application.

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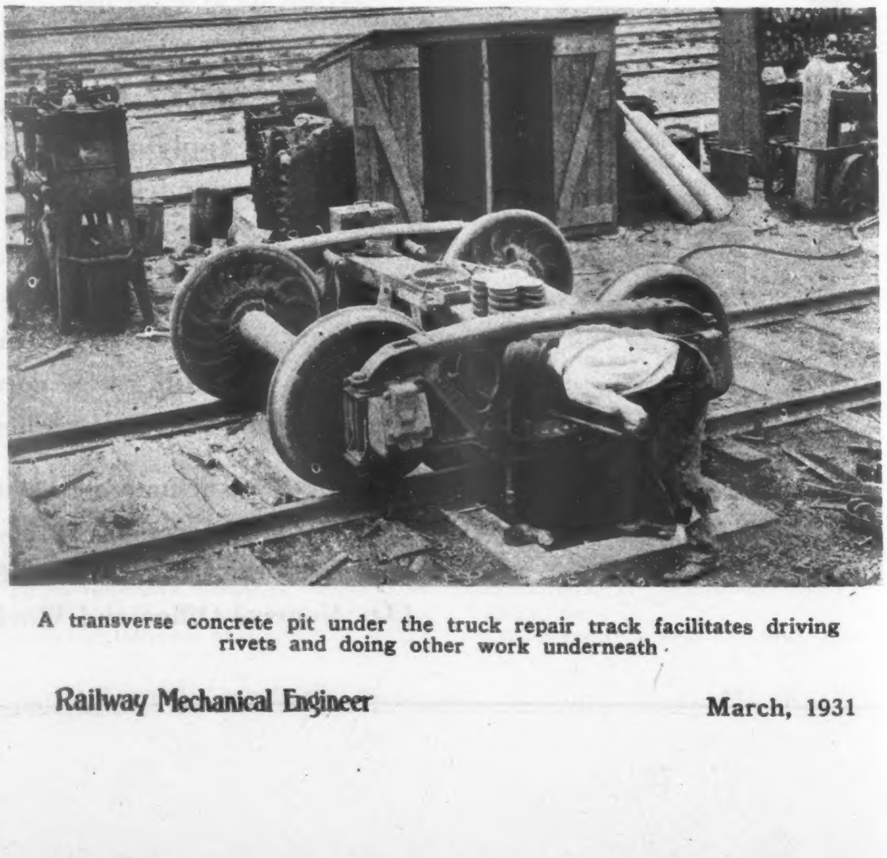

A transverse concrete pit under the truck repair track facilitates driving rivets and doing other work underneath